

AN ANALYSIS OF UNEMPLOYMENT :

AUSTRALIA, 1964 - 73 .

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A B S T R A C T

The objective of this thesis is to analyse the nature of unemployment in the Australian labour market, particularly that unemployment remaining when the economy is at or near full employment. The key concepts and definitions embodied in the method of approach to the study of unemployment are outlined in chapter 1.

Since the late 1950's there has been continued growth in the literature relating to the study of unemployment other than demand-deficient unemployment. A review of this literature, presented in chapter 2, resulted in a decision to base the analysis of unemployment largely on the unemployment-vacancy relationship and the use thereof in estimating the level of non demand-deficient unemployment.

Chapter 3 presents the analytical framework for the analysis of unemployment and includes an outline of the aggregate labour market, testing of the unemployment-vacancy relationship, the relationship between flows in the labour market and unemployment and unfilled vacancies, aggregate supply and demand factors and testing the sectoral determinants of non demand-deficient unemployment.

To undertake the analysis of unemployment and testing of relationships outlined in chapter 3, data are required for the following : unemployment and unfilled vacancies, supply and demand variables, unemployment and vacancy flows, labour turnover, sectoral unemployment and unfilled vacancies. Data requirements and availability for the period 1964-73 are considered in chapter 4.

Preliminary observations indicated that changes in the position of the aggregate unemployment-vacancy relationship and, thus in the level of non demand-deficient unemployment, occurred in 1967 and 1972.

The aggregate unemployment-vacancy relationship was estimated and tested for stability in chapter 5. This testing confirmed that two changes in the position of the aggregate unemployment-vacancy relationship took place in the period 1964-73, reflecting firstly a decrease and subsequently an increase in the level of non demand-deficient unemployment. Estimates of non demand-deficient unemployment are presented in chapter 5 and a series on demand-deficient unemployment is derived.

Chapter 6 examines the behaviour of the incidence and duration of both unemployment and unfilled vacancies, labour turnover and supply and demand variables. A general increase in the incidence of both unemployment and unfilled vacancies is apparent for the period 1964-73 and this reflects an increase in labour turnover. The testing of supply and demand variables produced unsatisfactory results.

A change in the position of the aggregate unemployment-vacancy relationship may be the result of a redistribution of demand between sectors, a change in the relative importance of sectors in the labour force or changes in sectoral unemployment-vacancy relationships. Chapter 7 looks at sectors of the labour force (age-sex, regions, occupations and industries). The findings indicate that the changes in the aggregate labour market are not uniform throughout the sectors and that a combination of factors is responsible for changes in aggregate non demand-deficient unemployment.

A summary of the findings of the analysis together with conclusions that emerge from the study are presented in chapter 8.

CHAPTER 1

I N T R O D U C T I O N

1.1 Objective

The objective of this thesis is to analyse the characteristics of unemployment in the Australian labour force. The time period for study is the decade 1964-73. The reasons for such an analysis are firstly, to elucidate the influence of various factors on unemployment in Australia; secondly, to explore the nature of unemployment that remains when the economy is at or near full employment; thirdly, to specify labour market parameters that could be changed as a means of reducing unemployment; and fourthly, to provide a framework for evaluating the potential effectiveness of alternative policies in reducing unemployment.

Full employment is a goal of Australian economic policy, based on the principle that there should be an employment opportunity for all who are willing, able and seeking to work. Unemployment, in that it reflects unused labour resources, is a key indicator of the degree of achievement of the full employment objective. The goal of full employment is normally expressed in terms of reducing the unemployment percentage to a certain level or to within specified limits.

"Governments should accept responsibility for stimulating spending on goods and services to the extent necessary to sustain full employment." 1

"...the goal is for the government to adjust its rates of taxation and expenditure to keep the sum of public and private aggregate demand for goods and services at the level the economy can produce at full employment." 2

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1. The Parliament of the Commonwealth of Australia, Full Employment in Australia (May, 1945), p.3.
 2. J.W.Nevile, Fiscal Policy in Australia : Theory and Practice (Cheshire, 1970), p.3.

2.

The above quotations emphasize three aspects regarding the goal of full employment in Australia : firstly, the achievement of full employment has been accepted as a responsibility of government in post-war years; secondly, the accepted means of achieving full employment is the manipulation of the aggregate demand for goods and services; and thirdly, full employment should be sustained (i.e. consistently achieved over a relatively long period of time).

The achievement of the goal of full employment is interrelated with the pursuit of other objectives of economic policy. The other objectives of economic policy in Australia are briefly summarised below :

- (1) Growth "...a high rate of economic and population growth, increasing productivity and rising standards of living." ¹

The achievement of this objective is measured in terms of changes in the Gross National Product at constant prices.

- (2) Price Stability "...the absence of a pronounced and sustained upward movement in prices such as would seriously affect the competitiveness of local industry in international markets or result in a socially unacceptable redistribution of real incomes..." ²

This goal is normally expressed in terms of keeping the percentage rate of change in a general price index below a certain level.

- (3) External Viability "...the maintenance of an adequate level of international reserves, i.e. adequate to meet both short term fluctuations and longer term difficulties..." ²

The alternative to the maintenance of such reserves would be structural readjustment in the economy.

Consider the movement of the economy towards full employment. Assume that initially the economy is in a period of low demand for labour

1. Department of Labour, An Analysis of Full Employment in Australia (Labour Market Studies No. 2), p.8.
2. Ibid., p.4 .

and that there is no significant upward pressure on prices and wages caused by excess demand in the labour market. The demand for goods and services could be increased without causing a marked increase in the rate of increase of wages and prices or the import propensity ratio (imports as a proportion of Gross National Expenditure).

Further increases in aggregate demand will result in excess demand in some sectors of the labour market. This will lead to upward pressure on the earnings of members of the labour force in these sectors and, in turn, to pressure for increases in wages and prices generally. Similarly, the excess demand will result in domestic production shortages and an increased reliance on imports to satisfy demand.

As the demand for goods and services is increased, the point will be reached beyond which the favourable effects on social welfare of further reductions in unemployment will be more than offset by higher inflation and balance of payments difficulties. There is a limit on the extent to which the demand for goods and services can be increased as a means of reducing unemployment : a limitation imposed by conflict with other goals of economic policy, particularly that of price stability.

It is possible that unemployment could be reduced, below the level feasible by means of increases in the demand for goods and services, through the implementation and integration of policies that attempt to change specific labour market variables. A prerequisite for the implementation of such policies is an analysis of the nature and causes of unemployment in Australia. The objective of this thesis is to provide, in part, such an analysis.

1.2 Key Definitions

This section presents definitions of concepts, listed below, that are central to the analysis.

- (1) Unemployment
- (2) Unfilled vacancy
- (3) Full employment
- (4) Demand-deficient unemployment
- (5) Non demand-deficient unemployment
- (6) Turnover in the labour force
- (7) Sectors of the labour force
- (8) Manpower policy

1.2.1 Unemployment To be considered unemployed a person must satisfy three criteria : he must be not working at present; he must be able to work and willing to accept an employment opportunity, at current wage rates, if it were offered; and he must be actively engaged in the search for a job.

"Unemployment" is normally measured as a stock : the total number of persons unemployed in a labour market at a particular point in time. The "unemployment percentage" is the number of persons unemployed expressed as a percentage of an aggregate such as employment or the number of persons in the labour force. "Employment" is mainly used in the computation of unemployment percentages in this analysis.¹

For Australia, the data series most commonly used as an indicator of unemployment is the total number of persons registered for employment with the Commonwealth Employment Service (C.E.S.).

1.2.2 Unfilled Vacancy An "unfilled vacancy" is a job for one person which is the object of an active search by an employer for a worker, an unfilled job position that an employer is seeking to fill by hiring a person from outside his organisation. There are three main criteria to

1. Employment is used because it is an appropriate base with respect to both unemployment and unfilled vacancies. For the levels of unemployment and unfilled vacancies experienced in the period under study, the numerical difference as between the use of employment and the labour force is insignificant.

be satisfied for a job opening to be regarded as an unfilled vacancy : the job must be currently unoccupied, be available for immediate occupancy by a worker from outside the organisation and be the object of an active search for a new worker.

Unfilled vacancies, like unemployment, are normally measured as a stock : the number of vacancies remaining unfilled at a particular point in time. The "unfilled vacancy percentage" is the number of unfilled vacancies expressed as a percentage of employment.

The most commonly used indicator of unfilled vacancies in Australia is the number of vacancies notified to the Commonwealth Employment Service remaining unfilled at a particular point in time.

1.2.3 Full Employment "Full employment" is defined as equality between the demand for, and the supply of, labour. The demand for labour is defined as :

...the number of persons that employers would like to have working, given the level and structure of wages in the economy...

There are two components of the demand for labour : firstly, satisfied demand - the number of persons employed; and secondly, the number of persons employers would like to add to their payrolls, but have not succeeded in so doing - unsatisfied demand.

To the extent that unsatisfied demand for labour gives rise to active search in the labour market, it will be reflected by unfilled vacancies. That is, unfilled vacancies can be regarded as a proxy for the unsatisfied demand for labour.

The supply of labour also consists of two components : satisfied supply - the number of persons employed; and unsatisfied supply - the number of persons who are not working but who would like to work, given

the level and structure of wages in the economy.

The number of unemployed persons, those who are not working and who are actively seeking work in the labour market, can be taken as a proxy for the unsatisfied supply of labour.

The point of balance between unemployment and unfilled vacancies represents full employment : the point at which the supply of labour, employment plus unemployment, equals the demand for labour, employment plus unfilled vacancies. This point of equality between unemployment and unfilled vacancies can be used to distinguish demand-deficient unemployment from other types of unemployment, non demand-deficient unemployment. This dichotomous classification of total unemployment is the central concept of the analysis of unemployment presented in this study.

1.2.4 Demand-Deficient Unemployment "Demand-deficient unemployment" is defined as the difference between actual unemployment and unemployment at full employment. Unemployment in excess of that at the point of equality between unemployment and unfilled vacancies is demand-deficient in that total expenditures in the economy are insufficient to generate job opportunities for all those willing, able and seeking to work. This inadequacy may be the result of a long-term trend (a persistent shortage of demand in relation to the available supply of labour), the cyclical variation of income and employment or a constraint on the level of the aggregate demand for goods and services (e.g. policy measures implemented to achieve price stability or to reduce imports). Demand-deficient unemployment may be negative, reflecting excess demand for labour. The appropriate policy, with respect to reducing positive demand-deficient unemployment, is to increase and stabilise the demand for goods and services in the economy.

1.2.5 Non Demand-Deficient Unemployment "Non demand-deficient unemployment" is defined as the level of unemployment at which unemployment and unfilled vacancies are equal. It consists of all unemployment other than demand-deficient unemployment. This component of unemployment is based on the simultaneous existence of unemployed persons and unfilled job vacancies. There are two reasons for this phenomenon :

- (1) The characteristics of the unemployed persons may not match the characteristics of the unfilled vacancies.
- (2) There may be unemployed persons with characteristics that fit those of the unfilled vacancies, but the elapse of time is required for "matching" and for the placement of the unemployed person in the unfilled vacancy.

The level of non demand-deficient unemployment in the economy is primarily determined by factors specific to the labour market and not by the aggregate demand for goods and services. The reduction of this component of unemployment requires the implementation of policies that will influence these factors that are operative in the labour market.

1.2.6 Turnover in the Labour Force One major determinant of the level of non demand-deficient unemployment is labour turnover. "Turnover in the labour force" is defined as the totality of flows of persons between alternative states in the labour market for some given period of time. There are three alternative states : in the labour force and employed, in the labour force and unemployed and not in the labour force.

The flows in the labour market consist of movements into, entering and re-entering, and out of the labour force and movements into and out of employment. Ideally these movements would take place without resulting in unemployment or unfilled vacancies : persons flowing freely between jobs and into or out of the labour force. In the real world it does take time to match persons with jobs. Even when job openings suitable for

unemployed persons exist the following time lags are involved :

- (1) Notification lag - the elapse of time required for information about a job vacancy to reach the job seeker.
- (2) Placement lag - the time required to actually fill the job opening once it has been found (e.g. interview time).

In that the elapse of time is required to bring about changes associated with turnover in the labour force, unemployment and unfilled vacancies, and the level of non demand-deficient unemployment, will be determined, in part, by the turnover behaviour of members of the labour force.

1.2.7 Sectors of the Labour Force To analyse unemployment, particularly non demand-deficient unemployment, it is necessary to consider sectors of the labour force as well as the labour force as a whole. "Sectors of the labour force" are sub-units of the labour market defined on the basis of characteristics of members of the labour force. There are four main categories of characteristics :

- (1) Demographic - age, sex, marital status, educational level, nationality.
- (2) Geographic - the location of members of the labour force : States, metropolitan/non-metropolitan
- (3) Occupational- occupation, occupational status, experience, level of skill.
- (4) Industrial - usual or most recent industrial attachment

1.2.8 Manpower Policy The purpose of manpower policy is to reduce the level of non demand-deficient unemployment in the labour market.

"Manpower policy" is defined as policy that attempts to change the labour market variables that determine the levels of unemployment and unfilled vacancies, for a given aggregate demand for goods and services. Manpower policy consists of policies that either improve the "matching" of unemployment and unfilled vacancies (e.g. retraining unemployed persons to meet the requirements of job openings) or improve the efficiency with

9.
which unemployed persons are placed in unfilled vacancies (e.g. improving the speed of the flow of information on job vacancies).

1.3 Non Demand-Deficient Unemployment

1.3.1 Introduction The use of the term "non demand-deficient unemployment" derives from a paper by Thirlwall,¹ the purpose of which was to consider the possible use of vacancy statistics in analysing types of unemployment. The introduction of the term was a response to

"...ambiguity and confusion regarding the terms 'structural', 'frictional' and 'demand-deficient' in relation to unemployment, and with the arbitrariness that has entered into the measurement of these types of unemployment." ²

Thirlwall suggests two conditions that a classification of unemployment needs to satisfy to be useful³: the classification should lend itself to the possibility of measurement and should be based on clearly defined, objective criteria. A classification method should also provide a guide regarding the appropriate policies required to reduce the level of unemployment. The use of data on unfilled vacancies to separate demand-deficient unemployment from other types of unemployment does satisfy these criteria.

1.3.2 Conceptual Comparability The implicit assumption of the classification method is that unfilled vacancies are comparable with unemployment.

The two concepts are similar :

An "unemployed person" is a person who is not working at present, is seeking to work and is actively engaged in the search for a job in the external labour market.⁴

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1. A.P.Thirlwall, Types of Unemployment : With Special Reference to Non Demand-Deficient Unemployment in Great Britain (Scottish Journal of Political Economy, vol.16, February 1969) pp. 20-49.
 2. Ibid., p. 20 .
 3. Ibid., p. 22 .
 4. The "external" labour market involves interaction between an organisation and persons outside that organisation. The "internal" labour market refers to the set of practices or rules that govern promotions, transfers, layoffs and retirements within an organisation. Entry from

An "unfilled vacancy" is a job opening which is not occupied at present and which is the object of an active search in the external labour market for a worker.

The two concepts are related by means of interaction one with the other in the labour market. Unemployment and unfilled vacancies are stocks : the number of persons unemployed and vacancies unfilled at a point in time. The interaction in the labour market is between the flows of unemployed persons and vacancies as well as between the stocks at any point in time (e.g. the job openings available for unemployed persons include those that will arise in the near future, as well as those currently available). To the extent that the stocks reflect the flows the concepts of unemployment and unfilled vacancies are representative of the interaction in the labour market.

The interaction is between the supply of, and the demand for, labour : between persons offering labour and employers offering jobs. Most of this dual offering is "matched" and results in employment (satisfied demand). Some labour that is offered will not be matched with suitable jobs and will result in unemployment (unsatisfied supply). Some jobs that are offered will not be matched with persons seeking employment and will result in vacancies remaining unfilled (unsatisfied demand). The unsatisfied supply of, and demand for, labour (unemployment and unfilled vacancies respectively) interact in an attempt to effect further "matches" and so convert unsatisfied supply to satisfied supply (employment). Assuming no additions to the supply of labour, this will reduce the stock of unemployment.

The basis for comparing unemployment and unfilled vacancies is the similarity between the search of the unemployed person for a job and that of the employer for labour. The concept of search requires some effort,

outside the organisation, and thus unfilled vacancies, may be restricted to certain job classifications ("ports of entry").

some utilisation of resources on the part of the seeker. To be considered unemployed a person must be actively looking for work (the search will be of minimal effort in some cases, such as turning up for interviews occasionally). Similarly, employers will not utilise resources to recruit labour unless they actually have a position which they wish to fill. One difference between unemployment and unfilled vacancies is the size of the units supplying labour (individuals or households) and those demanding it (organisations of varying size). This difference will influence the methods of search and the comparability between unemployment and unfilled vacancies.

One possible reason for noncomparability of unemployment and unfilled vacancies is that vacancies may be filled by other than unemployed persons. In particular, jobs available at any point in time may entice additional persons into the labour force. The comparability of the two concepts is upheld in that only those currently engaged in the search process in the labour market are included.

1.3.3 Empirical Comparability The empirical comparability between unemployment and unfilled vacancies derives from the observed "inverse parallelism" between the time series of the two variables :

"There are good prima facie reasons for distrusting the statistics of unfilled vacancies since they neither record transactions nor register decisions, but represent a sort of queue. The size of a queue may be either more or less than the real unsatisfied demand : people may either duplicate orders or join several queues; or they may give up trying and not join a queue at all. The unemployment figures, in contrast, are 'hard' statistics : a person can register only once as unemployed and he has a financial reason for doing so.

But the more closely the behaviour of the vacancy statistics is compared with that of the unemployment figures, the clearer it seems that up to a point they are rather reliable indicators. There is a striking inverse parallelism

between the seasonal swings of the two series. It is equally striking that when seasonal movements are removed, changes in demand still appear to be equally reflected in both series...These observations give one a certain confidence in the vacancy statistics, which further analysis in general confirms." ¹

The above statement relates to data for the United Kingdom. The same "inverse parallelism" is evident between the C.E.S. series on unemployment and unfilled vacancies for Australia. Data are introduced at a later stage in support of this assertion.

The term "bias" will be used to refer to that which causes the measurement of unfilled vacancies to fail to correspond to that of unemployment. The major source of bias is that the C.E.S. coverage of vacancies, the proportion of total vacancies in the labour market notified to the C.E.S., is less than the C.E.S. coverage of unemployment. ² This means that there is a "statement error" in the data on unfilled vacancies. This error can be adjusted for by estimating the "statement ratio" : the ratio of registered to "true" vacancies.

1.3.4 The Model The basis of the model is the separation of total unemployment into two components : demand-deficient unemployment (ddu) and non demand-deficient unemployment (ndu). The level of non demand-deficient unemployment is given by the level of either unemployment or unfilled vacancies at full employment, as defined. Expressed in terms of percentages of total employment (E), we have :

$$u = u_{dd} + u_{nd} \quad \text{where}$$

1. J.C.R.Dow and L.A.Dicks-Mireaux, The Excess Demand for Labour : A Study of Conditions in Great Britain, 1946-56, (Oxford Economic Papers, February, 1958), p.2 .
2. "...the C.E.S. almost certainly has a smaller coverage of job vacancies than of the unemployed...", Department of Labour, Analysis of Full Employment, p.13 .

u = total unemployment percentage
 u_{dd} = demand-deficient unemployment percentage
 u_{nd} = non demand-deficient unemployment percentage

Demand-deficient unemployment is given by the difference between total unemployment and non demand-deficient unemployment :

$$\text{i.e. } u_{dd} = u - u_{nd}$$

Non demand-deficient unemployment is that level of unemployment at the point of equality between unemployment and unfilled vacancies :

$$\text{i.e. } u = v$$

The above model applies to the "true" series on unemployment and unfilled vacancies. Assume that the unemployment data series represents the true series, but that there is a statement error in the unfilled vacancies series. The statement ratio (s) is given by :

$$s = v_r / v_{\text{true}} \quad \text{where}$$

v_r = registered vacancies

v_{true} = "true" vacancies

Non demand-deficient unemployment will be given by unemployment at the point at which :

$$u = v_r / s$$

1.3.5 Estimation of Non Demand-Deficient Unemployment In determining the level of non demand-deficient unemployment it is necessary to estimate the relationship between unemployment and unfilled vacancies. Both unemployment (u) and unfilled vacancies (v) are subject to a lower limit of zero and the relationship between the two variables is expected to be a non-linear form as shown in figure 1.1 below.

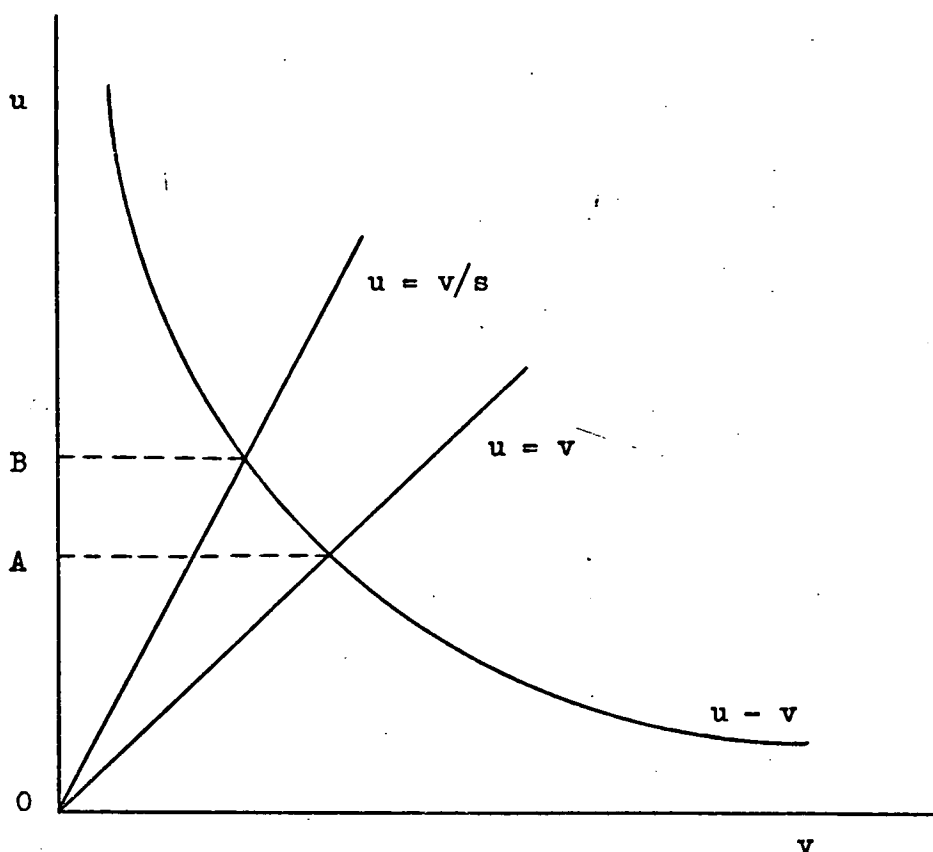


fig. 1.1

Relationship Between u and v

The relationship between unemployment and unfilled vacancies will be termed the "u-v relationship". A given u-v relationship, such as that presented in figure 1.1, is based on a given level of non demand-deficient unemployment (u_{nd}). A change in the level of non demand-deficient unemployment will be reflected by a shift in the position of the u-v relationship. Movements along the u-v relationship represent changes in the aggregate demand for labour and, thus, in demand-deficient unemployment (u_{dd}). The change in total unemployment as between any two points in time will be made up of the change in non demand-deficient unemployment and the change in demand-deficient unemployment.

The first step in estimating u_{nd} is to plot the observations on u and v on a graph similar to figure 1.1. The next step is to estimate a regression equation between u and v. The relationship is expected to

be of the form :

$$u = a \cdot v^b \quad a > 0, \quad b < 0$$

This involves fitting a regression equation which is linear in the logarithms of the variables :

$$\text{i.e. } \log u = \log a + b \cdot \log v$$

If there were no statement error in the unfilled vacancy data, the value of u_{nd} would be the level of u at which the estimated $u-v$ regression equation intersects the line $u = v$. This would be unemployment of OA as shown in fig. 1.1 . Allowing for the statement error in the unfilled vacancies series (v) means that u_{nd} is calculated as the level of u at which the regression equation intersects with the line $u = v/s$. This represents a higher level of u_{nd} of OB .

It is possible that the level of u_{nd} is affected not only by the current stocks of unemployment and unfilled vacancies, but also by the direction and rate of change thereof (i.e. "loops" in the $u-v$ relationship). This possibility is illustrated in fig. 1.2 below.

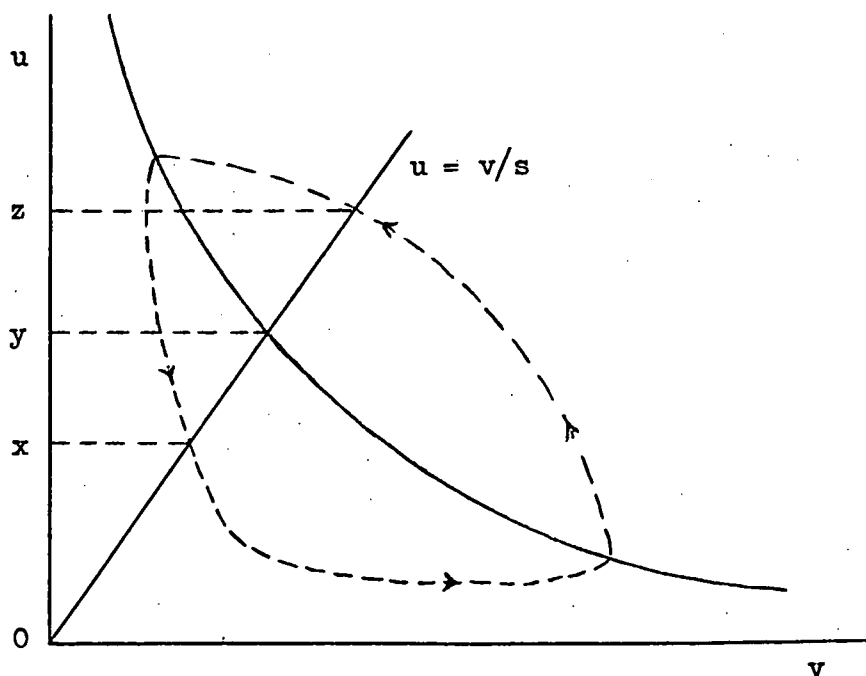


fig. 1.2

"Loops" in the u-v Relationship .

In this situation the level of u_{nd} when the demand for labour is increasing (Ox) will differ from, in this case will be less than, the level of u_{nd} when the demand for labour is decreasing (Oz). The level of u_{nd} estimated on the basis of the $u-v$ relationship will be an average of Ox and Oz (i.e. Oy).

1.3.6 Changes in Non Demand-Deficient Unemployment Changes in the level of u_{nd} over time can be analysed by considering time series graphs of unemployment (u_t) and unfilled vacancies (v_t). This is illustrated in fig. 1.3 below. A change in u_{nd} will be indicated by the intersection of the u_t and v_t series at a different level of u and v . The possibility of "loops" in the $u-v$ relationship can also be considered on the basis of such graphs : they will be suggested by the intersection of u_t with v_t at a different level of u and v when v_t is increasing (u_t decreasing) than when v_t is decreasing (u_t increasing).

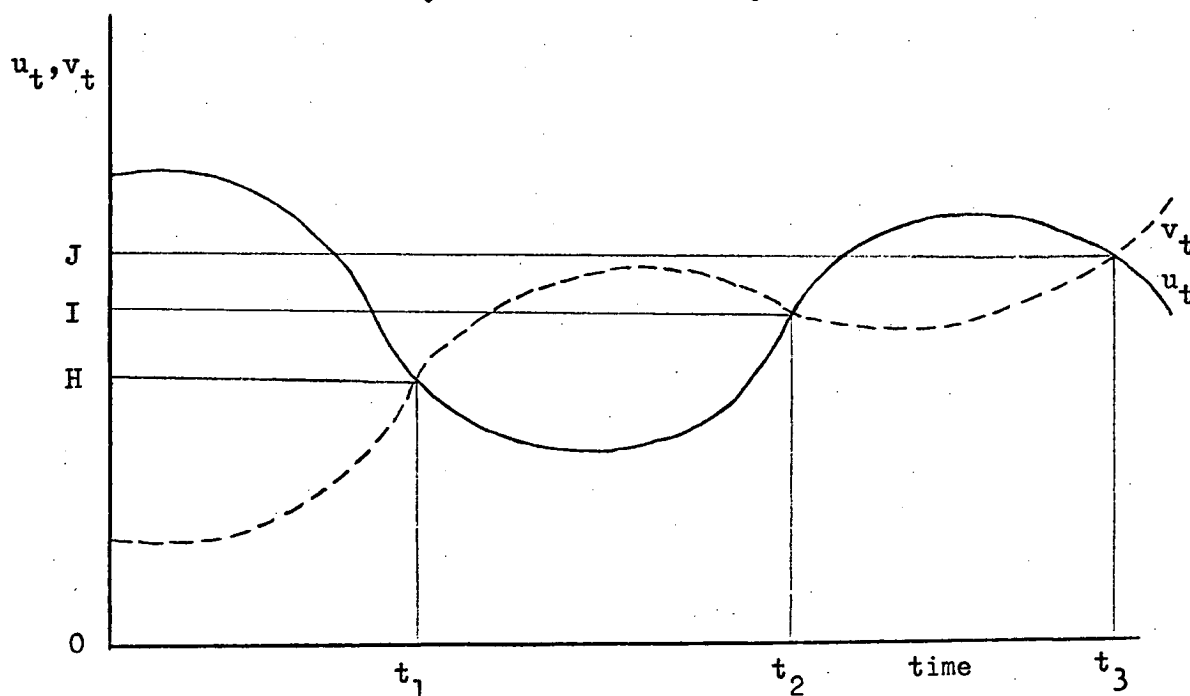


fig. 1.3

Changes in u_{nd} .

At time t_1 , a period of increasing demand for labour, u_{nd} is OH. A possible "loop" is suggested in that at time t_2 , a period of declining demand for labour, u_{nd} is higher at OI. Figure 1.3 also suggests that there has been an increase in u_{nd} as between t_2 and t_3 : u_{nd} is equal to OJ.

Variations in the level of non demand-deficient unemployment will be reflected by changes in the position of the $u-v$ relationship. For example, the above change in u_{nd} would mean that the $u-v$ relationship has shifted upwards and to the right : from $u-v_1$ to $u-v_2$, as shown in figure 1.4 below.

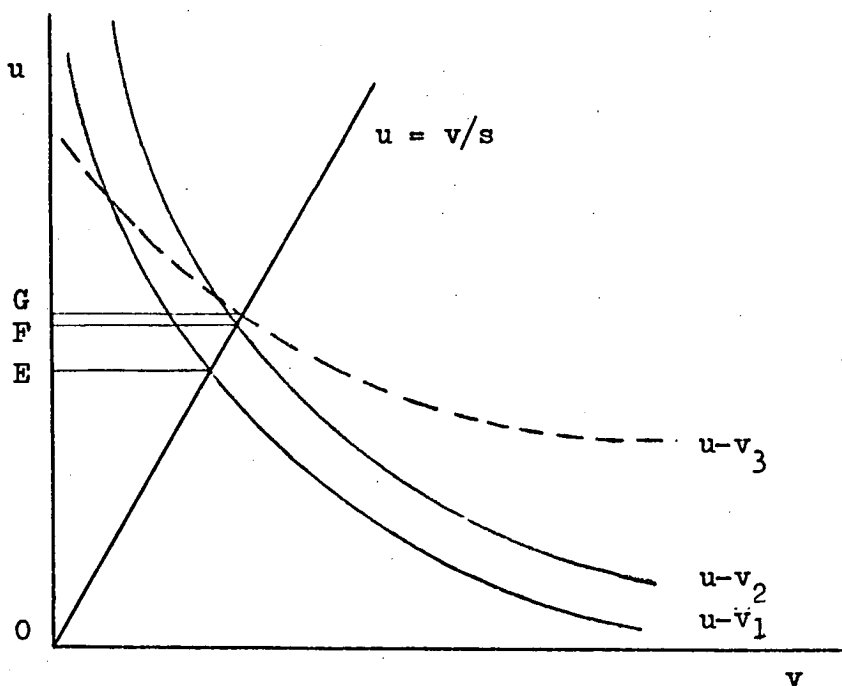


fig. 1.4

Changes in the $u-v$ Relationship

The $u-v$ relationship is of the form :

$$u = a \cdot v^b$$

$$\text{i.e.} \quad \log u = \log a + b \cdot \log v$$

Changes in the position of the $u-v$ relationship will be reflected by a change in the intercept term of the log function ($\log a$),

a change in the elasticity of u with respect to v (b) or some combination of both. A change in the intercept term means that the u - v relationship has shifted uniformly for all levels of the demand for labour. The shift upwards and to the right, from $u-v_1$ to $u-v_2$, in fig. 1.4 is such a change. The level of u_{nd} increases from OE to OF. A change in the elasticity of u with respect to v means that there has been a change in the relative response of unemployment and unfilled vacancies to changes in the demand for labour. For example, the shift from $u-v_2$ to $u-v_3$ in fig. 1.4 is dominated by a change in the elasticity of u with respect to v . As the demand for labour increases, u decreases by less than previously for each unit increase in v . That is, increases in the demand for labour are less effective in reducing unemployment. There is a small increase in u_{nd} from OF to OG.

1.3.7 Determinants of Non Demand-Deficient Unemployment The level of non demand-deficient unemployment in the labour market is determined primarily by factors specific to the labour market and not by the aggregate demand for goods and services. To formulate and implement policies aimed at reducing this component of unemployment it is necessary to look more closely at the determinants of non demand-deficient unemployment.

Both unemployed persons and unfilled vacancies have certain characteristics and it is the imbalance between these characteristics, and the elapse of time required for the matching process, that determines the level of non demand-deficient unemployment in the labour market. The characteristics of unemployment and unfilled vacancies are similar, as can be seen in the outline presented below. The mismatching of only one of these characteristics may be sufficient to prevent the placement of an unemployed person in an unfilled vacancy.

Characteristics of an unemployed person :

- a. Age and sex
- b. Education / skill level attained
- c. Geographical location
- d. Occupation and experience
- e. Industry of usual or most recent employment
- f. Wage demands and expectations
- g. Unfavourable personal characteristics (e.g. drunkenness)
- h. Time of year at which unemployed

Characteristics of an unfilled vacancy :

- a. Age and sex requirements
- b. Education and skill requirements
- c. Geographical location of job
- d. Occupational and experience specifications
- e. Industry
- f. Wage offers and expectations of employers
- g. Unfavourable characteristics (e.g. dangerous working conditions)
- h. Time of year at which the job opening is available

The characteristics are not entirely fixed and part of the matching process in the labour market involves the interaction and adjustment of these characteristics (e.g. the wage expectations of unemployed persons most probably will decline as the duration of their unemployment increases). The characteristics can also be changed through policy initiatives : manpower policy (e.g. government financial assistance in the relocation of unemployed workers).

The degree of mismatching or "maladjustment" in the labour market and the speed with which unemployed persons are placed in unfilled vacancies will determine the position of the u-v relationship and the level of non demand-deficient unemployment in the labour market. The objective in this study will be to elucidate the nature and causes of non demand-deficient unemployment by means of an analysis of turnover in the labour force and sectors of the labour force.

One limitation of the analysis to be presented in this thesis should be noted at this stage. The many determinants of unemployment interact in a complex manner in the real world. The analysis of unemployment, however, involves the consideration of the factors separately: looking at only one aspect such as occupation at a time and not, as would be preferred, the factors simultaneously. For example, a person may be unemployed partly because his occupational qualifications are unsuitable, partly because he lives in an area of low demand for labour and partly because he has a bad work record.

1.4 Turnover in the Labour Force

The turnover behaviour of members of the labour force is a major determinant of the position of the unemployment-vacancy relationship. Changes in the stocks of unemployed persons and unfilled vacancies as between any two points in time are regulated by flows between the various states in the labour market in the intervening period. Turnover in the labour force is normally large relative to the stocks of unemployment and unfilled vacancies and small changes in labour market flows can have a substantial impact on the corresponding stocks. The position of the u-v relationship is related to the general level of turnover in the labour market. The major flows that influence the levels of unemployment and unfilled vacancies are :

- (1) Entrants to the labour force
- (2) Quits by employed persons
- (3) Retrenchments of employed persons

These are the flows which are most sensitive to the demand for labour. Quits by employed persons and entrants to the labour force are expected to be positively related to changes in the demand for

labour while retrenchments will be inversely related to the demand for labour. The impact of these flows on unemployment depends on :

- (1) The size of the flows : the general level of turnover in the labour force.
- (2) The proportion of each turnover flow which incurs unemployment.
- (3) The average duration of unemployment.

Similarly, the impact of the flows on the stock of unfilled vacancies depends on :

- (1) The size of the flows.
- (2) The proportion of each turnover flow which results in vacancies remaining unfilled.
- (3) The average time that vacancies remain unfilled.

The sensitivity of the above factors to changes in the demand for labour will have an effect on the slope of the u-v relationship :

" the slope of the UV relation depends critically on the cyclical sensitivity of quits, layoffs, and labour force entrants, the proportion of each turnover flow which incurs unemployment, and the cyclical behaviour of the duration of vacancies and unemployment." ¹

The general level of turnover in the labour force, for all levels of demand for labour, will determine the "log a" term in the u-v relationship. For example, an increase in the general level of turnover will cause a shift such as that from $u-v_1$ to $u-v_2$ in fig. 1.4 . The sensitivity of the factors outlined above to the demand for labour will determine parameter "b" of the u-v relationship. For example, if quits become more sensitive to increases in the demand for labour there will be a shift of the u-v relationship such as that from $u-v_2$ to $u-v_3$

1. R.J.Flanagan, The U.S. Phillips Curve and International Unemployment Rate Differentials, (American Economic Review, vol. 63, no. 1, March, 1973), p.116.

in fig. 1.4 : as the demand for labour increases the level of unfilled vacancies relative to unemployment will be greater than previously as a result of the increased quit rate.

1.5 Sectors of the Labour Force

There are two reasons for the analysis of sectors in the labour market : firstly, overall stability in the aggregate labour market can conceal sectoral changes and, secondly, given changes in the aggregate labour market, sectoral analysis can assist in more precisely determining the source of these changes.

Consider the connection between the aggregate u-v relationship and sectoral u-v relationships. Assume that there are two equal-sized sectors in the labour market : sector 1 has a u-v relationship such as $u-v_1$ and sector 2 has a u-v relationship of $u-v_2$. The aggregate relationship, u-v, will be a weighted average of the two sectoral relationships. This is illustrated in fig. 1.5 below.

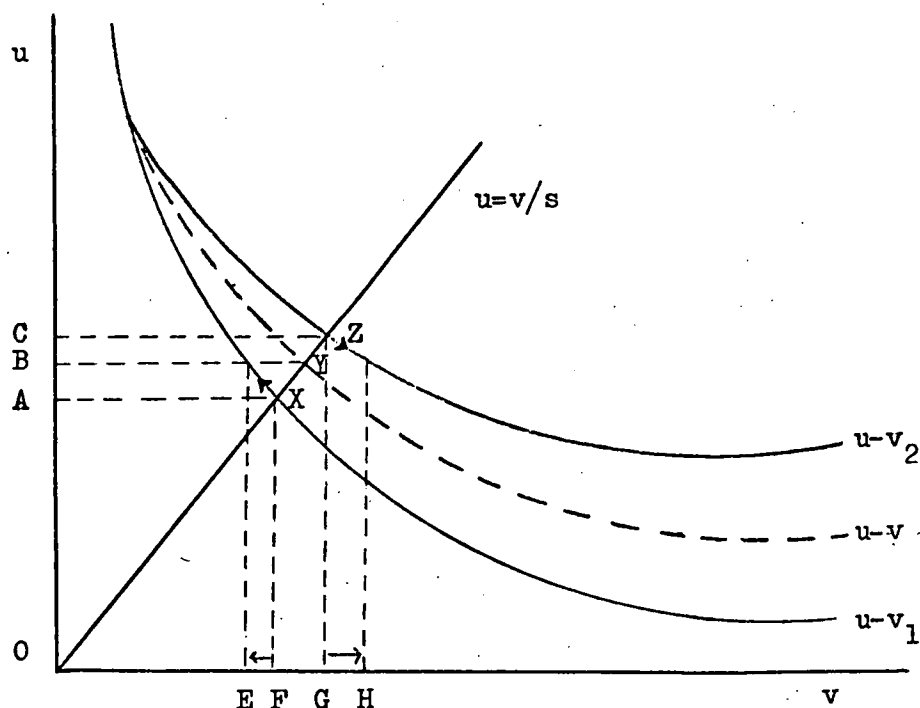


fig. 1.5

Sectoral and Aggregate u-v Relationships

Assume also that the statement ratio (s) is the same for both sectors. The level of non demand-deficient unemployment in sector 1 is OA and in sector 2 is OC. The aggregate level of non demand-deficient unemployment will be an average between the two sectors of OB. There can be three underlying causes of a change in the position of the aggregate u-v relationship :

- (1) A change in a sectoral u-v relationship :
if u-v₁ moved upwards and to the right, the aggregate u-v relationship would move in a similar fashion, other things being equal.
- (2) A change in the relative importance of a sector, as measured by the sector's share of the labour force or of employment : for example, if sector 2 increased in importance relative to sector 1, then the aggregate u-v relationship would shift upwards and to the right with an associated increase in non demand-deficient unemployment.
- (3) A redistribution of demand between sectors :
assume that initially demand is distributed such that there is no demand-deficient unemployment either sectorally or in total (e.g. the points X,Y,Z). Assume that demand falls in sector 1 such that unemployment increases to the level of OB. Unfilled vacancies will fall from OF to OE. In order to maintain the aggregate unemployment rate at OB, demand is increased in sector 2 : unemployment in sector 2 falls to OB and unfilled vacancies increase from OG to OH. This increase in unfilled vacancies more than offsets the fall in unfilled vacancies in sector 1 and the net result is that total unfilled vacancies, at the unemployment rate of OB, are greater : the aggregate u-v relationship has again shifted upwards and to the right.

In actually selecting the sectors for analysis, from the large set of possible sectors, the following two factors will be taken into account. Firstly, to be considered separately there should be differences in the nature of unemployment as between sectors. In particular, there should be differences in either sectoral unemployment rates or in the ratio of unemployment to unfilled vacancies by sector. Secondly, a sector should have a material impact on the position of the aggregate unemployment-vacancy relationship : a sector may have unique or

substantially different behaviour patterns, but may not be of sufficient relative size (as measured by the sector's share of unemployment or the labour force) for separate analysis. The actual choice of sectors will, of course, be conditioned by the data that are available. There are four labour force characteristics that are used to define sectors in this study : demographic (age/sex) ; geographic (States, metropolitan/non-metropolitan); occupational; and industrial.

1.6 Manpower Policy

The objective of manpower policy is to reduce the non demand-deficient component of unemployment. The determinants of non demand-deficient unemployment may be summarised as :

- (1) Seasonal variations in the demand for and supply of labour.
- (2) An uneven distribution of demand and supply as between age-sex groups, geographical areas, occupations and industries.
- (3) Turnover in the labour force.
- (4) Unfavourable characteristics of members of the labour force such as poor attitudes to work.
- (5) The inability of the supply of labour and its price (wages) to fully and instantaneously adjust to changes in demand and supply, in total and by sector.

Manpower policy encompasses measures aimed at reducing the impact of the factors outlined above. The various factors interact : a policy aimed at reducing one factor will have an effect on other factors. For example, the redistribution of the demand for labour to areas of low demand (high unemployment) may affect the general level of turnover in these low demand areas.

The aim of manpower policy is to bring about a more even distrib-

ution of unemployment (i.e. reduce the dispersion of sectoral unemployment rates), provide a better matching between the sectoral supply of, and demand for, labour and improve the efficiency of the allocative mechanism in the labour market. This objective may be expressed in terms of attempting to move the aggregate unemployment-vacancy relationship towards the origin, so reducing the level of non demand-deficient unemployment. This is illustrated in fig. 1.6 below.

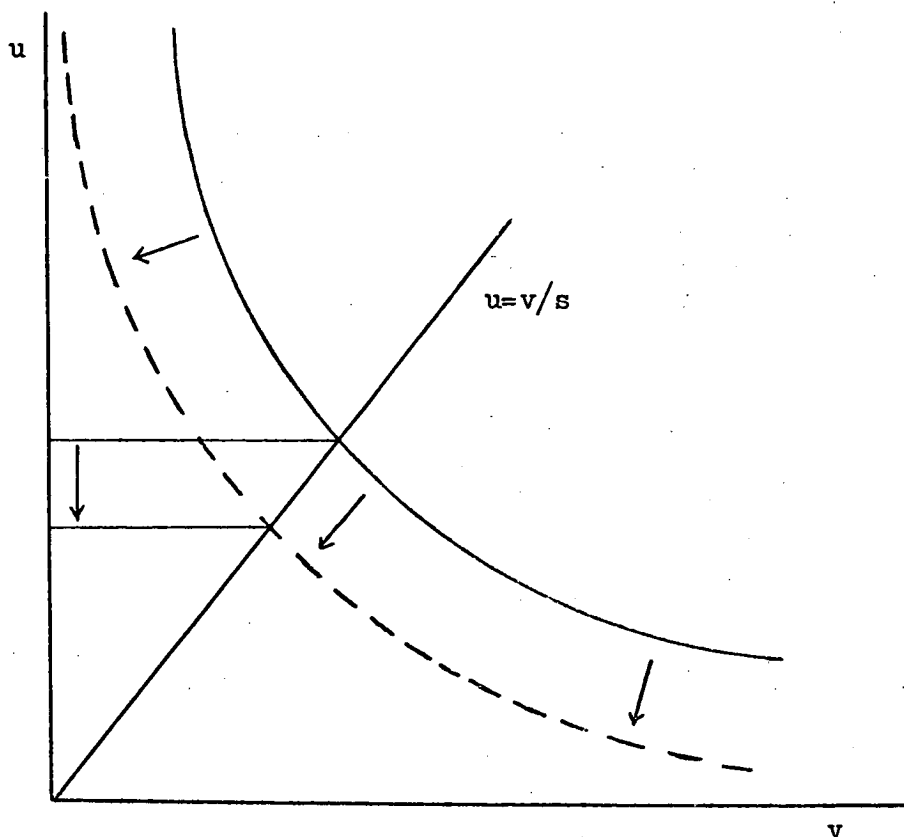


fig. 1.6

Objective of Manpower Policy

Manpower policy, through changing the position of the unemployment-vacancy relationship, can limit the trade-off between unemployment and wage and price stability by exerting a downward force on unemployment independent of the aggregate demand for goods and services. It would be possible to achieve a lower unemployment percentage for

any given rate of change of money wages or prices. This is illustrated in fig. 1.7 . The shift in the unemployment-vacancy relationship, as in fig. 1.6, is reflected by a shift in the relationship between unemployment and the rate of change of money wages (w) or prices (p). The shift will enable the policy-maker to move to a preferred position, so increasing social welfare. Assuming indifference curves as shown in fig. 1.7, the policy-maker can move from indifference curve I_1 to the preferred position on I_2 : a lower unemployment percentage and a lower rate of change in money wages or prices.

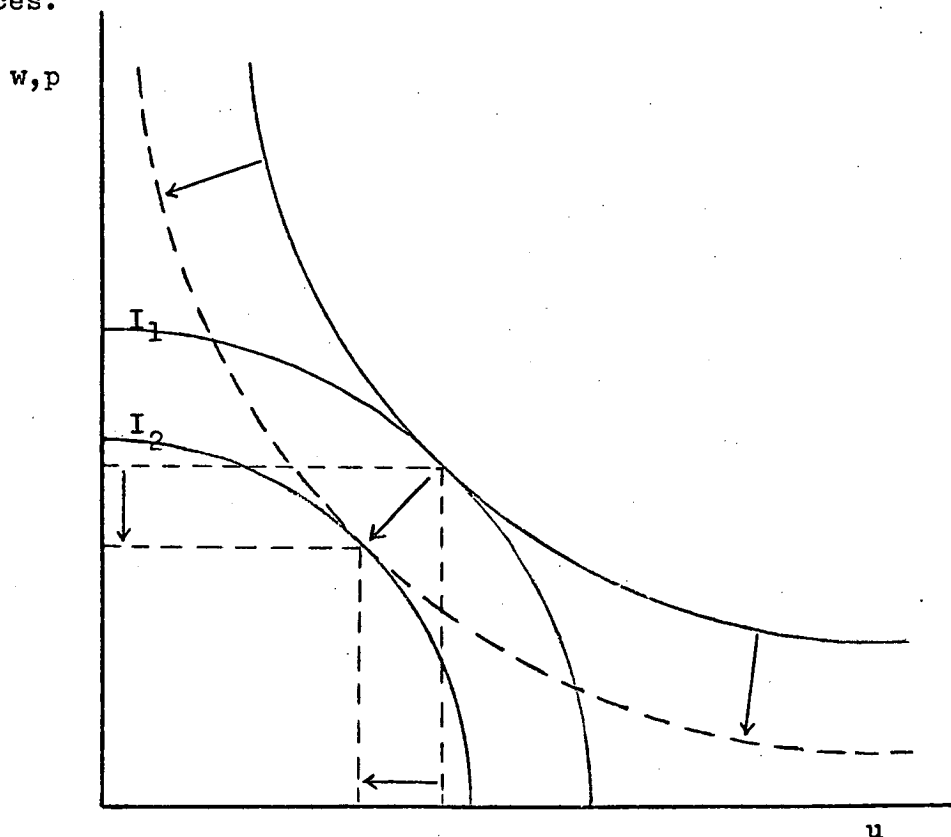


fig. 1.7

Trade-off Between Unemployment and Wage
and Price Changes

The underlying basis of the above is that the position of the "Phillips" curve is in part dependent on the position of the unemployment-vacancy relationship. This derives from the view that the rate

of change of money or real wages will be a function of, amongst other things, excess demand for labour. Excess demand for labour is measured as the difference between the unfilled vacancies percentage and the unemployment percentage. We have,

$$w, w/p = k (v - u)$$

where k is a coefficient reflecting the flexibility of wages to the excess demand for labour. The value of " $v - u$ " will be dependent on the position of the unemployment-vacancy relationship and the point on that relationship at which the labour market is. The rate of change of wages will, thus, depend in part on the position of the unemployment-vacancy relationship (the level of non demand-deficient unemployment). Assuming that wage changes directly affect price changes, the rate of change in prices will also be dependent in part on the position of the unemployment-vacancy relationship. The analysis in this study is limited to the factors determining the position of the unemployment-vacancy relationship for Australia,

1.7 Outline of Following Chapters

Chapter 2 presents a selective review of literature relating to the study of unemployment, particularly unemployment of a non demand-deficient nature. Chapter 3 outlines the analytical framework which serves as a plan for the analysis of unemployment and testing of unemployment-vacancy relationships, for the aggregate labour market and for sectors. The data to be used in subsequent testing and analysis is discussed and presented in chapter 4. Chapter 5 is concerned with the estimation of the unemployment-vacancy relationship for Australia and with testing for changes in the position of this relat-

ionship. Chapter 6 tests the behaviour of the incidence and duration of unemployment and unfilled vacancies and the behaviour of factors determining the aggregate demand for, and supply of, labour. Chapter 7 contains an analysis of unemployment for sectors of the labour force. Sectoral unemployment-vacancy relationships are estimated and tested for stability in the period 1964-73 and supplementary analysis of the structure of unemployment and unfilled vacancies by sector is presented. The final chapter summarises the results of the study and makes general conclusions that flow from the results.

CHAPTER 2

L I T E R A T U R E R E V I E W

2.1 Introduction

This chapter presents an outline of literature relating to the study of unemployment, particularly that unemployment which remains when the economy is at or near full employment (i.e. non demand-deficient unemployment). Keynes' "General Theory" had the effect of reducing the emphasis placed on this type of unemployment in economic theory and analysis. Before the appearance of the General Theory a body of literature was developing which attempted to relate unemployment to the behaviour patterns of employers and workers and, eventually, to the costs and utilities associated with alternative labour market behaviour. This literature was concerned with determining the unemployment percentage, for a given level of demand for labour, resulting from labour market frictions, seasonal fluctuations in output, and so on, rather than with the relationship between the unemployment percentage and the demand for labour. The impact of Keynes' General Theory, coupled with falling demand for labour in the depression of the 1930's, forestalled the development of this literature :

"There is little point in speculating as to how this approach would have developed had the depression of the 1930s not occurred. The fact is that it was buried beneath the avalanche of falling aggregate demand for output, and the concomitant rise in unemployment. Economists, like the public at large, lost interest in what determined the level of unemployment at a given level of aggregate demand, and focussed attention upon the relation between changes in aggregate

demand and changes in employment...However, in the late 1950s and early 1960s the problem of reconciling full employment with a minimum of inflation re-awakened interest...i.e. economists have again become interested in the question of how much unemployment will remain when further increases in the rate of aggregate expenditure become 'intolerably inflationary'." ¹

Since the resurgence of interest in unemployment other than demand-deficient unemployment in the late 1950s there has been a continued growth in the literature relating to the study of unemployment. The outline presented in this chapter comprises a selective survey of the major foci of attention in the development of this literature.

2.2 Classical and Keynesian Unemployment

Before considering the literature since the late 1950s, a brief outline is presented of the treatment of unemployment by the classical economists, typified by Pigou, and by Keynes. The major difference between Keynesian and classical theory relates to their analysis of the effect of money wage changes on the level of employment and unemployment...

"Under the earlier theory, personified by pre-General-Theory Pigou, changes in money wages play an important part in changing the level of output, employment and unemployment. For example, a sufficient reduction in money wages during slack periods could eliminate unemployment. According to the most simplified Keynesian version, money-wage changes would have no effect on the level of output and unemployment and, even after modifications, the theory considers wage reduction as an incomplete or, at best, slow-moving measure toward the restoration of full employment." ²

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1. M.W.Reder, The Theory of Frictional Unemployment (Economica, Feb. 1969) pp. 1,2 .
 2. R.Pearlman, Labor Theory (John Wiley and Sons Inc. 1969) p.143 .

In classical theory, the equilibrium real wage is determined by the intersection of the labour demand and supply schedules. The labour demand schedule is the downward-sloping marginal physical productivity schedule shown as DD in fig. 2.1 below. The conventional upward-sloping labour supply schedule is shown as SS in fig.2.1 . Equilibrium is at point P : a full employment situation (labour demand equals labour supply). The equilibrium wage is AP.

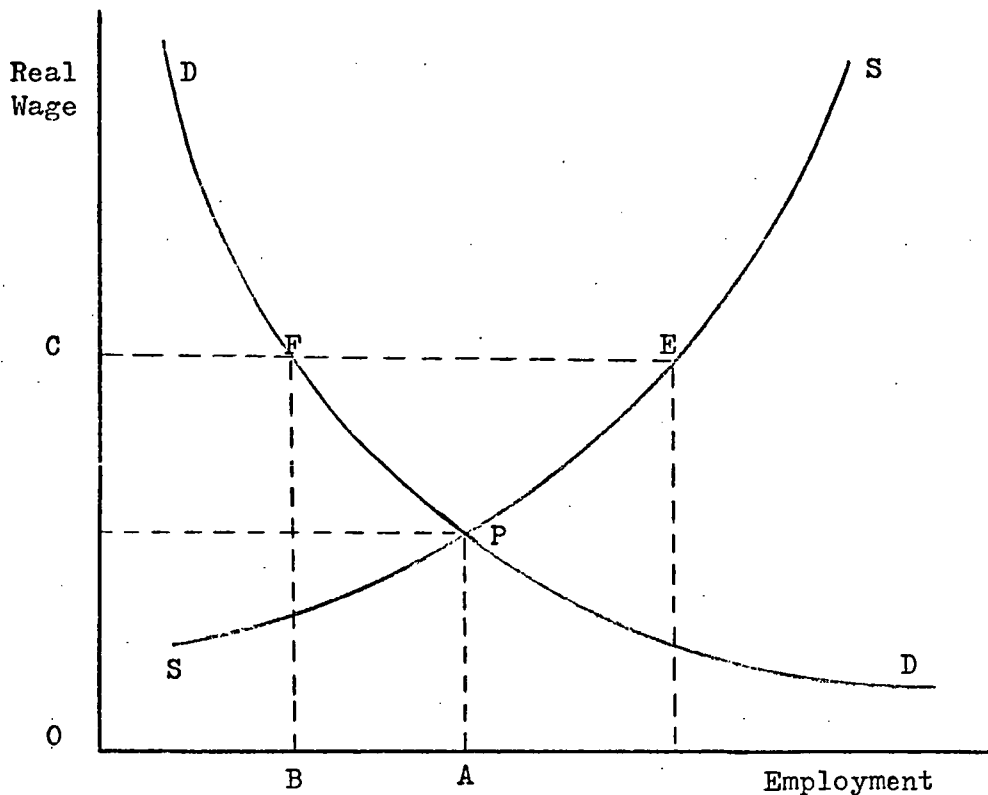


fig. 2.1

Classical and Keynesian Wage-Employment
Relationships

In the classical model there is a strong tendency for wage-rates to be so related to demand that everyone is employed. Any unemployment that does arise results from frictional resistances associated with the wage adjustment process. Changes in demand conditions are continually taking place and these frictional resistances prevent the

required wage adjustments from taking place instantaneously. Thus, assuming perfect competition among workers and a perfectly mobile labour force, the classical model attributes unemployment to the elapse of time involved in the adjustment of wages to changes in demand.

In the full employment equilibrium situation the real wage is AP and employment is OA. There is no unemployment. Assume now that labour supply is perfectly elastic over the range CE with a real wage of BF, which for some reason has been set higher than the full employment equilibrium wage of AP. Employment would fall to OB and unemployment of FE would arise. This unemployment is "voluntary" in that it results from workers being unwilling to allow their wages to fall to AP. "Involuntary" unemployment is that unemployment which results from the operation of frictional forces in the labour market. Perlman presents a "working definition of classical involuntary unemployment":

"Men are involuntarily unemployed if, being out of work, they would be willing to work for a real wage below the current level." ¹

Perlman notes that this definition has many similarities to the Keynesian definition of involuntary unemployment :

"Men are involuntarily unemployed if in the event of a small rise in prices of wage-goods relatively to the money wage, both the aggregate supply of labour willing to work for the current money-wage and the aggregate demand for it at that wage would be greater than the existing volume of employment." ²

According to both the classical and Keynesian models, voluntary unemployment results from the unwillingness on the part of the workers to accept a reduction in real wages. The central difference between

1. R.Perlman, Labor Theory p. 145 .

2. J.M.Keynes, The General Theory of Employment, Interest, and Money (Harcourt, Brace and Co., New York, 1936) p.15.

the two models is the time dimension they employ : to the classicist, the failure to accept a reduced real wage prevents the attainment of full employment now; to a Keynesian this attitude would prevent the employment of these workers when aggregate demand rose.

Assume, in relation to figure 2.1, that employment is currently OB at a real wage of OC. To the classicist, full employment would be attained provided workers let their real wage fall to AP, given a labour supply schedule of SS. Any unemployment currently existing would be temporary, resulting from the random setting of a wage of OC too high to clear the market. If labour supply were CFES (e.g. as a result of governmental establishment of a minimum wage), then the workers will have an higher real wage, but at the cost of unemployment.

To the Keynesian the current real wage of OC will have resulted from the state of the demand for labour. As future demand rose more workers would be required at a lower real wage of AP and unemployment would be eliminated provided workers allowed such a fall in their real wage. If the labour supply schedule were CFES, real wages would not be allowed to fall and the potential increase in aggregate demand would not occur : unemployment of FE would be permanent, but voluntary.

2.3 The Great Unemployment Debate

In the late 1950s and early 1960s there was a noticeable tendency for the U.S. unemployment percentage, in periods of economic recovery, not to fall to the levels experienced previously in periods of high demand for labour. This led to a debate as to whether structural causes or inadequate demand were at the root of the unemployment

problem. The inadequate demand proponents argued that the cause of the high unemployment percentage was the incomplete nature of the post-1958 economic recovery. The main need was, thus, for greater stimulation of aggregate demand. The structuralists claimed that unemployment could have been substantially reduced, at the current level of aggregate output, by adapting the unemployed to the job openings. They also argued that increased spending would reduce unemployment only at the cost of a higher rate of inflation as excess demand appeared in sectors of the labour market. Their viewpoint was that structural elements were at the root of the failure to attain full employment.

The two theories relating to the explanation of the causes of unemployment may be termed the aggregate demand theory and the structural transformation theory. A clear statement of the position adopted by the aggregate demand theorists is provided by Knowles and Kalachek :

"The aggregate demand theory maintains that recent unemployment rates are explainable by traditional supply and demand analysis. In a dynamic economy, the population of working age, the stock of capital, and the technical efficiency of production all show year-to-year increases. Hence, the economy's potential output at full employment of productive resources rises from year to year. At times, aggregate demand for goods and services may not grow as rapidly as the economy's output potential...The unemployment rate has been quite high since mid-1957, because the rate of growth in final demand has been low relative to the actual and normal rates of growth in potential supply made possible by increases in capital stock, labour force, and productivity." ¹

The aggregate demand theorists did not hold that there were no "structural" causes of unemployment. They accepted that some unemployment would exist even in periods of high demand for labour, periods in

1. J.W.Knowles and E.D.Kalachek, Higher Unemployment Rates, 1957-60; Structural Transformation or Inadequate Demand, (U.S. Government Printing Office, 1961) p.6 .

which the number of jobs looking for workers is equal to the number of workers looking for jobs. Such unemployment was considered the inevitable result of the operation of dynamic labour markets : the seasonal variations in demand and supply, changes in the composition of demand, technological change, geographical migration and turnover in the labour force, coupled with the time-consuming nature of labour market adjustments, would cause some unemployment even when the total demand for labour is adequate.

The aggregate demand theorists accepted these structural factors in the causation of unemployment, but argued that the major reason for the higher unemployment percentages in the 1958-63 period was inadequate demand. They also argued that there had not been major structural changes in the U.S. economy over the period 1958-63 as compared with earlier periods.

Knowles and Kalachek¹ carried out an extensive evaluation of the two theories based on data for the U.S. economy. They considered the behaviour of output per man-hour, the variability of employment by industry, changes in the occupational composition of the labour force, the dispersion of sectoral unemployment rates around the unemployment rate for experienced wage and salary earners, geographical mobility and other similar factors. The conclusion deriving from their analysis was that there was little evidence to suggest an increase in structural factors in 1957-60, as compared with earlier periods.

One of the main protagonists of the structural transformation theory was Killingsworth.² He argued that the observed increase in

1. Ibid.

2. Killingsworth, C.C. "Automation, Jobs and Manpower" in Bowen, W.G. ed., Labor and the National Economy (Norton, 1965).

unemployment was mainly structural by nature : the product, primarily, of changes in the structure of the economy, of changes in the relative importance of various sectors in the labour market. In particular Killingsworth saw technological change as having a dominant role in the causation of structural problems :

"...the rising unemployment of the past decade has been caused primarily by the interaction between new technology and the changing consumption patterns of a mature mass-consumption society. This interaction has caused sharp employment declines in some sectors of the economy, has slowed job growth in other sectors, and has helped to create labour shortages in still other sectors. The overall effect has been growing imbalance in the labour market, with a great surplus of unskilled, poorly educated workers co-existing with serious shortages of many kinds of highly-educated workers." ¹

Killingsworth summarised the impact of technological change on the U.S. economy into three factors. Firstly, the technological revolution in agriculture had caused an upward tilt in productivity growth which, coupled with slower growth in output, had led to an acceleration in the decline in employment in agriculture. Secondly, the technological revolution in manufacturing had resulted in an increase in the ratio of non-production to production employees. Thirdly, the technological revolution in service-producing industries had seen the advent of the computer with an associated reduction in the number of low-skilled clerical jobs and an increase in the relative importance of higher-skilled classifications.

The corollary of the structural transformation theory is that the expansion of demand would lead to severe shortages of workers in the higher skilled categories. The approach to full employment would

1. Killingsworth, C.C. "Structural Unemployment in the U.S." in Stieber, J. ed. Employment Problems of Automation and Advanced Technology (1966) pp. 128,129 .

require the implementation of programmes to provide basic skills for those displaced by technological change.

The general outcome of the debate was that the evidence for the U.S. economy did not support the structural transformation theory. That is, it was recognized that structural problems did exist, but the evidence did not support the view that these problems had increased in the period under consideration. For example, disadvantaged workers such as unskilled persons did have higher unemployment percentages than say experienced workers, but there had not been an increase in this disparity for disadvantaged workers generally. The main reason for the higher unemployment percentage for the nation as a whole was inadequate demand :

"...we should conclude that on the measured data for 1958-63 the basic reason for the poor record has been a chronic slack in effective demand, a deficiency that has extracted its toll throughout the economy." ¹

The aggregate demand theorists were finally vindicated by the success of the 1964 tax cuts in the U.S., and the associated increase in demand, in reducing the national unemployment percentage below 4 per cent. Killingsworth maintained and supported his viewpoint.² He argued that if it were not for rising enrolment in unemployment relief programmes, definitional changes and the impact of the Vietnam war buildup, then the national unemployment percentage would not have fallen so far. He also pointed out that the impact of the manpower programmes was partially to disguise changes in relative unemployment rates for disadvantaged groups.

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1. G.H.Hildebrand, "Some Alternative Views of the Unemployment Problem in the U.S." in J.Stieber, Employment Problems, p. 116.
 2. C.C.Killingsworth, "Full Employment and the New Economics" (Scottish Journal of Political Economy, v.16, Feb. 1969) pp.1-19.

The debate gave rise to benefits with respect to the study of unemployment other than that caused by a general deficiency of demand. Firstly, there was a recognition that persistent structural problems did exist with respect to unemployment. Secondly, the conclusion was reached that whether structural unemployment had increased was not as important as the fact that it was too high anyway. Thirdly, in the process of the debate a large volume of data on unemployment, for both the aggregate labour market and for sectors, was gathered and analysed. Fourthly, interest was awakened in the possibility of implementing policies aimed at reducing unemployment of a structural nature.

2.4 Structure of Unemployment

Involved in the unemployment debate was continual recourse to the presentation of disaggregated data on unemployment. The characteristics of members of the labour force provide alternative means of dividing the labour force into sectors. For example, the labour force could be divided into sectors on the basis of age-sex characteristics (e.g. males aged 15-19 years). Alternatively, the occupation of the worker may define sectors of the labour force. Each sector of the labour force can be considered as having its own specific unemployment percentage. The "structure of unemployment" may be defined as the set of specific unemployment rates relating to the sectors that have been defined :

"In its simplest sense, the structure of unemployment may be defined as the distribution of the unemployed among different groups of workers. In itself, however, this distribution is of little interest unless it can be related to the distribution of the labour force. We will, therefore, define the structure of unemployment as the relationship between these two distributions, or, more

precisely, as the set of the unemployment rates specific to the various sectors of the labour force among which we may wish to distinguish. We will say that the structure, as distinguished from the level, of unemployment has changed whenever the changes in specific unemployment rates are not equiproportionate." ¹

Changes in the structure of unemployment would be indicated by changes in sectoral unemployment percentages relative to the aggregate unemployment percentage. The analysis of unemployment undertaken in the above-mentioned debate sought to determine whether such changes had taken place. More particularly, attempts were made to ascertain whether the changes that had taken place were responsible for an increase in "structural unemployment". An increase in structural unemployment would be reflected by an overall increase in the disparity of sectoral unemployment percentages.

Analysis of the structure of unemployment in a labour market emphasises the fact that unemployment is not an homogeneous phenomenon : there is not just one unemployment percentage, but an extensive set of differing unemployment percentages for individual sectors within the labour market. These sectoral unemployment rates are affected by the demand and supply conditions for specific types of labour and will respond in different ways to changes in aggregate demand. Analysis of the structure of unemployment is concerned with both the distribution of unemployment between sectors at a particular point in time (the set of sectoral unemployment percentages) and with changes in that distribution over time (the behaviour of the sectoral unemployment percentages). For reliable results with respect to comparing the structure of unemployment at different points in time, it is necessary to compare data for periods which are similar with respect to the aggregate demand for labour.

1. E.Kleiman, "Measuring the Structural Severity of Unemployment" (Industrial Relations, vol. 7, Feb. 1968) p. 146 .

In the analysis of the structure of unemployment the following aspects received emphasis¹ :

- (1) Unemployment by age and sex
- (2) Unemployment by nationality / race / colour
- (3) Unemployment by occupation
- (4) First-job seekers
- (5) Unemployment by industry
- (6) Education and unemployment
- (7) Long-term unemployment
- (8) Unemployment by geographical location

The analysis of unemployment by sectors at particular points in time served to identify groups of workers with persistently high unemployment rates relative to other sectors of the labour force. For the U.S. labour market the following high unemployment sectors were identified² :

- (1) Young workers (job shifting; lack of economic responsibilities and skill)
- (2) Older workers (over 45 years of age : long duration of unemployment)
- (3) Negro workers (cyclically sensitive)
- (4) Unskilled workers (cyclically sensitive)
- (5) High unemployment industries (seasonal, cyclically sensitive and declining industries)
- (6) Depressed geographical regions

The literature on unemployment confirmed the existence of structural factors in the causation of unemployment. The more important issue concerned whether these structural factors had increased in intensity. That is, had the inequality between sectoral unemployment rates become greater ?

"The hallmark of rising structural unemployment is a tendency for unemployment to become more concentrated

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1. e.g. R.A.Gordon, The Goal of Full Employment (John Wiley, 1967)
 2. O.Eckstein, "Aggregate Demand and the Current Unemployment Problem" in A.M.Ross, ed. Unemployment and the American Economy (John Wiley and Sons. Inc. 1964).

in certain groups of the labour force or sectors of the economy. This comes about because the demand for certain types of labour falls, compared with the demand for labour generally, while the supply of those kinds of labour fails to fall, or rises, in relative terms!"¹

Solow² tested the hypothesis that there had been a substantial increase in the level of structural unemployment in the U.S. over the period from the late 1950s to the early 1960s. His method of testing was to find two periods for which the general pressure of demand for labour was about the same. If unemployment were higher or, more particularly, if unemployment were more concentrated in particular sectors of the labour market, it could be concluded that structural unemployment had increased. With respect to regional unemployment, Solow concluded that there were no signs of increasing concentration of unemployment in particular regions of the U.S. The range of regional unemployment rates appeared, if anything, to be narrowing : regional unemployment rates were closer to the national average in 1960 than in 1950. His finding on unemployment by age-sex sectors was that the higher unemployment rate in 1962, as compared with 1955, did not result from either the relative worsening of unemployment among special groups or a shift in the composition of the labour force toward age-sex groups with higher sectoral unemployment rates. He noted that there had been an increase in the unemployment rates for young people, but argued that this resulted from the inadequate nature of the demand for labour. The evidence on occupational and industrial unemployment suggested that, although there had been significant changes in the relative unemployment rates for individual occupations and industries, there was no general tendency for increases in the

1. R.Solow, "The Nature and Sources of Unemployment in the U.S." in Wicksell, K. International Trade and Finance - a Collected Volume of Wicksell Lectures, 1958-64 (Stockholm : Almqvist and Wiksell, 1964) p. 262.

2. Ibid.

unemployment rates of high unemployment occupations and industries relative to the overall unemployment rate. Solow also observed that there was no evidence of a shift in the relationship between the help-wanted index for the U.S. and unemployment.

Although the evidence presented in the literature, particularly for the U.S., did not generally support the structural transformation theory, attention was given to the study of the structure of unemployment and a change in emphasis took place. Early literature (e.g. Killingsworth) emphasised technological change as the major structural factor. Increasingly consideration was given to the composition of the labour force, particularly the demographic composition. It was recognised that changes in structural unemployment could result from either changes in sectoral unemployment rates or from changes in the relative importance of sectors in the labour force.

Gordon¹ analysed the structure of unemployment at full employment and concluded that changes in labour force composition had contributed to significant increases in the national unemployment percentage. He cited white teenagers, white female adults and nonwhite females as examples. Similarly, Gallaway and Dyckman² concluded that changes in the demographic composition of the labour force and in the relative unemployment percentages for particular demographic sectors were the main cause of increases in structural unemployment :

"Between 1953 and 1966 the full employment-unemployment rate apparently increased by one full percentage point which is about a 33 per cent increase. Twenty per cent of this increase, or 0.2 percentage points, is attributable to changes in the demographic composition of the labour force. The other 80

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1. R.A.Gordon, "Unemployment Patterns With 'Full Employment'" (Industrial Relations, vol.8, 1968-69, Oct. 1968) pp. 46-72.
 2. L.E.Gallaway and Z.Dyckman, "The Full Employment-Unemployment Rate : 1953-80"(Journal of Human Resources, v.5, Fall 1970), pp. 487-510.

per cent results from relative increases in unemployment rates in the teenage and nonteenage female sectors of the labour force." ¹

A refinement which took place in the analysis of the structure of unemployment was the use of measures of dispersion.

"We will now broaden this definition and consider unemployment to be, from the structural aspect, least severe when the distribution of the unemployed is proportional to that of the labour force - i.e. when the specific unemployment rates are the same in all sectors - and we will consider it to be structurally more severe the greater the inequality of these specific rates.

Thus, a measure of unemployment's structural severity is, perforce, one of its concentration in particular segments of the labour force, or - which is the obverse of the same coin - of the dispersion of the specific unemployment rates." ²

The use of measures of dispersion, such as the standard deviation and the coefficient of variation, means that it is possible to represent the distribution of sectoral unemployment rates around the overall unemployment percentage by a pure number. A measure of dispersion could be obtained for each set of sectoral unemployment percentages. (e.g. occupational unemployment percentages). These measures of dispersion provide a guide to the sectoral imbalance in the distribution of unemployment. The literature asserted that secular increases in the measures of dispersion reflect increases in structural unemployment.

One measure of dispersion of unemployment suggested is that proposed by Gordon.³ He suggests comparing each sector's share of unemployment with its share of the labour force. That is, consider the difference :

1. Ibid. p. 509.

2. E.Kleiman, "Measuring the Structural Severity of Unemployment" (Industrial Relations, vol.7, Feb. 1968) p.148.

3. R.A.Gordon, The Goal of Full Employment, pp. 92-94.

$$U_i/U - L_i/L \quad \text{where}$$

U = total unemployed persons
 U_i = unemployed persons in sector i
 L = total labour force
 L_i = labour force in sector i

For any selected characteristic of members of the labour force (e.g. occupation) it is possible to sum the absolute differences between each sector's relative contribution to total unemployment and its share of the labour force. This provides a measure of the sectoral imbalance of unemployment (D_u) :

$$D_u = \sum \left| U_i/U - L_i/L \right|$$

If for any particular classification of the labour force sectoral unemployment percentages are equal, then D_u will have a value of zero. If the sectoral unemployment percentages differ then D_u will be positive. The larger the differences between the various sectors' contributions to unemployment and to the labour force, the larger will the measure of dispersion be. Gordon proposes the use of this measure of dispersion of sectoral unemployment percentages to detect changes in the level of structural unemployment :

"We suggest that our relative dispersion measure, D_u , taken over a series of years approximating aggregative full employment, provides a reasonable test as to whether a significant change in the amount of structural unemployment has occurred." ¹

2.5 Structural Unemployment

The term "structural unemployment" was used extensively in the debate on the causes of unemployment, but in most cases no explicit definition of the term was given. Changes in the structure

1. Ibid. pp. 92-94 .

of unemployment were assumed to reflect changes in structural unemployment. As the literature on unemployment developed there were attempts to define and measure structural unemployment. Two of the definitions proposed in the literature are outlined below.

2.5.1 Berman¹ Berman sought to construct an absolute measure of structural unemployment, a measure which would enable the measurement of the amount of structural unemployment at any point in time, and not just increases or decreases therein. For such measurement a precise definition is required and Berman suggests a definition based on the results of policy actions :

"...structural unemployment is defined as that amount of unemployment (less minimum frictional and seasonal) which cannot be removed by monetary and fiscal policy without creating substantial continuing inflation (as opposed to one-shot, non repeatable price rises) deriving directly from shortages of labour." ²

Imagine the sequential operation of policies. Assume that unemployment now is U_A and that aggregate demand is increased through monetary or fiscal stimulus until excess demand appears in significant sectors of the labour market. The excess demand will lead to "bottlenecks" in the production process and to upward pressure on wages and prices. Let unemployment at this "bottleneck" stage be U_B . It would be possible to implement a retraining and relocation programme, associated with some increment in demand, in order to reduce unemployment further. Similarly, policies could be adopted to improve the efficiency of the matching of workers seeking jobs with job openings. These policies would, in time, reduce unemployment

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1. (1) B.R.Berman, "Alternative Measures of Structural Unemployment" in A.M.Ross : Employment Policy and the Labour Market (Uni. of California Press, 1965).
 - (2) B.R.Berman and D.E.Kaun, Structural Unemployment in the U.S. (Washington - U.S. Govt. Printing Office, 1967).
 2. Ibid. (2) p. 1 .

to U_C , which Berman asserts consists of the hard-to-employ and the minimum frictional unemployment⁴. Excluding the hard-to-employ from U_C would leave us with unemployment of U_D .

Berman suggests that $U_B - U_D$ be adopted as a measure of structural unemployment : includes the hard-to-employ and those who would be employed because of retraining and other labour market policies. Included in the latter component are those who would be employed as a result of the indirect effects of labour market policies (e.g. unskilled workers hired to assist the newly trained men). That part of frictional unemployment which is "rockbottom" is not included, but that part which could be eliminated by programmes to improve the efficiency of the labour market, and which could meet a cost-benefit test, is included. Structural unemployment is, therefore :

"...that part of unemployment which should be eliminated through labour market policies, except for that amount which could be eliminated by general demand-stimulation measures unaccompanied by other measures." ¹

2.5.2 Lipsey² Lipsey presents a similar definition of structural unemployment to that of Berman, but within the framework of the trade-off between price changes and unemployment.

"Consider the problem of reducing unemployment. Almost everyone would prefer less unemployment to more unemployment ceteris paribus. Problems arise, however, when the objective of reducing unemployment conflicts with other objectives such as maintaining a stable level of prices and a satisfactory balance of payments. The problems that concern us can be illustrated by considering only two policy variables : the level of unemployment (U) and the general level of prices (P)." ³

1. Ibid. (1) p. 257 .

2. R.G.Lipsey, "Structural and Deficient-Demand Unemployment Reconsidered" in A.M.Ross, Employment Policy and the Labour Market.

3. Ibid. pp. 210-211 .

4. "Frictional unemployment" arises as a result of the continual process of change in the dynamic labour market.

In figure 2.2 below the unemployment percentage (u) is plotted against the percentage rate of change of prices (p). The RR curve shows combinations of u and p which can be obtained by varying the level of aggregate demand. Generally, a higher level of demand will be associated with lower u and higher p .

Assume that the policy maker can say that there is some rate at which he is prepared to trade an increase in the rate of change of prices (p) for a reduction in unemployment (u). That is, the policy maker can specify his preference function. His preference function is represented in figure 2.2 by the set of indifference curves I, I', I'', I''' . More preferred positions are reached by movement in a "southwest" direction.

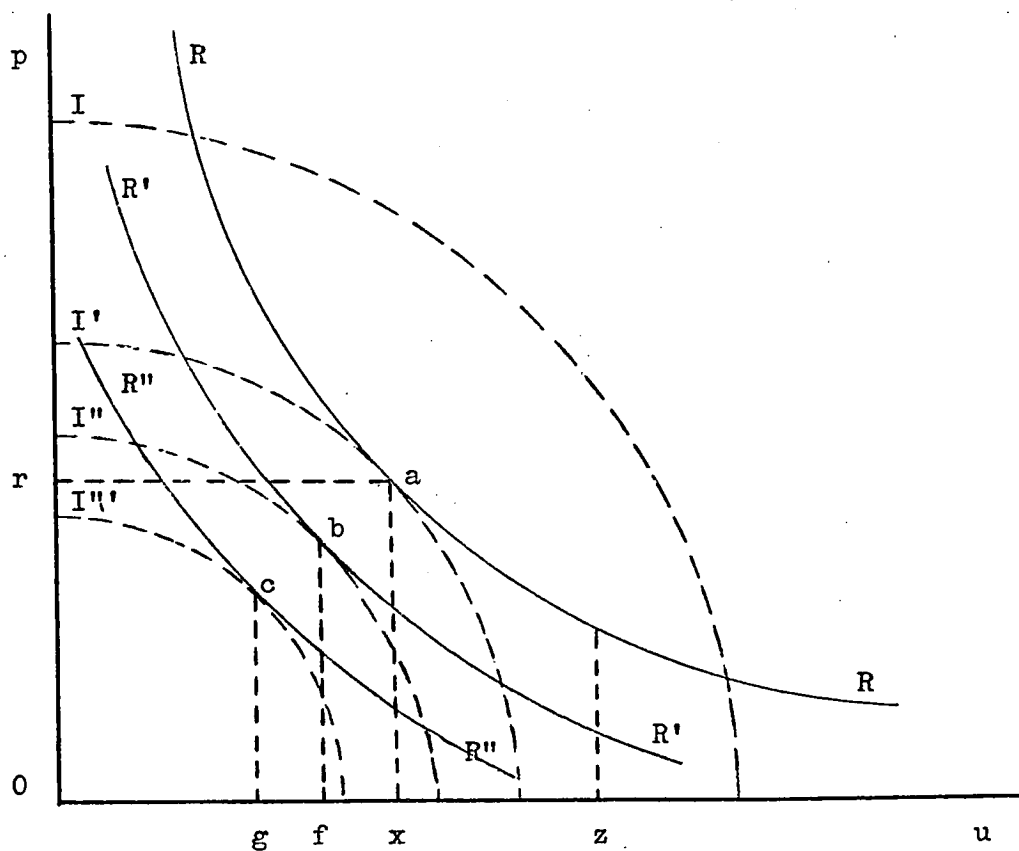


fig. 2.2

Trade-off Between u and p

The point a at which indifference curve I' is tangential to the RR curve indicates the target of aggregate demand policy. This point represents a rate of inflation of O_r and an unemployment percentage of O_x . If unemployment is higher than O_x then aggregate demand could be increased to reduce the level of unemployment. This would be at the cost of higher inflation, but this cost would be acceptable to the policy-maker.

Consider reducing unemployment below O_x . It would not be rational to try to do this by increasing the aggregate demand for goods and services, but it may be possible to do so by shifting the RR curve downwards and to the left. Such a shift could be induced by the implementation of manpower policies such as retraining and relocating workers who are currently unemployed. These policies will have a cost and their implementation would be subject to cost-benefit analysis. Assume that policies which satisfy the cost-benefit criterion could shift the RR curve to the position $R'R'$. This new curve would be tangential to an higher indifference curve (I'') at a lower level of unemployment (O_f) and a lower rate of increase in prices.

It would be possible to find policies which could shift the RR curve further to the left (e.g. retraining of redundant workers who are close to retiring age). These policies may show a loss with respect to monetary costs and benefits, but could be implemented for social reasons. Assume that all such policies could shift the RR curve to the position $R''R''$. Assuming also that no further shifting of the curve is possible unemployment could be reduced to O_g . This means that if the current unemployment percentage is O_z , then we can say :

- (1) The amount z_x is deficient-demand unemployment : unemployment which could be removed by increasing demand without encountering unacceptable rates of inflation.
- (2) The amount x_g refers to structural unemployment : it could be removed by structural cures (manpower policy).
- (3) The amount O_g is frictional unemployment : an amount which is consistent with the goal of full employment.

2.5.3 Deficiencies of Definitions The Berman definition has the disadvantage that it is difficult in practice to precisely identify the points used to measure structural unemployment. It is especially difficult to identify the cause of "substantial continuing inflation" as deriving from "bottlenecks" in the labour market. The definition lacks sufficiently objective criteria for the measurement of structural unemployment.

The Lipsey definition depends on the relationship between p and u and the difficulty in specifying this relationship and the instability therein affects the reliability of the proposed measure of structural unemployment. The associated problem is that it is difficult in practice to differentiate between inflation that results from labour shortages and that which derives from other sources.

The deficiencies of the above definitions encouraged the search for more objective criteria for the measurement of structural unemployment. In particular, attention was focused on the possible use of data on unfilled vacancies for classifying unemployment.

2.6 Use of Vacancy Data

Literature relating to the labour market emphasised unemployment in the period between the late 1950s and the mid 1960s. In the 1960s growing attention was given to the potential use of vacancy

statistics, in association with data on unemployment, for the measurement of structural unemployment. No comprehensive series on unfilled vacancies existed for the U.S. economy and the interest in vacancy data resulted in a conference on "The Measurement and Interpretation of Job Vacancies".¹ Job vacancy statistics were seen as a potentially useful aid in the determination of the most appropriate policy to reduce unemployment without at the same time causing inflation. The number of job vacancies is a measure of the unsatisfied demand for labour which can be matched with unemployment representing the unsatisfied supply :

"...our goal is not to analyse the reasons for the 'mismatching' of jobs and persons, but the more modest one of suggesting measures of the extent of the problem... A convenient term to describe the amount of mismatching of jobs and persons is 'maladjustment' in the labour market!...We can estimate the number of unemployed that would exist if total vacancies were equal to total unemployment and use this number as our measure of the amount of maladjustment." ²

Thirlwall³ recognised that the term "structural unemployment" had come to mean different things to different people. He also noted the subjective nature of the definitions proposed by Berman and Lipsey : the need to estimate the degree of inflation regarded as tolerable or to specify the policy maker's preference function between inflation and unemployment. There was a need for the use of more objective criteria in the classification of unemployment :

"American economists frequently bemoan the lack of a comprehensive series of unfilled vacancy statistics for their economy. They feel that with the end of

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1. National Bureau of Economic Research, The Measurement and Interpretation of Job Vacancies (Columbia Uni. Press, 1966).
 2. J.G.Myers and D.Creamer, Measuring Job Vacancies (The Conference Board, Studies in Business Economics, No.97), pp.108-109.
 3. A.P.Thirlwall, Types of Unemployment, pp. 20-27.

such statistics greater objectivity could be introduced into the measurement of types of unemployment...The implicit assumption is that unfilled vacancies could be used as an index of unsatisfied demand for labour to at least separate out, in a reasonably objective way, unemployment due ostensibly to a deficiency of demand from other types of unemployment (commonly referred to as structural and frictional unemployment)" ¹

Perlman outlined a model of structural unemployment based on unfilled vacancies ² similar to that of Thirlwall on which section 1.3 is based. The main aspects of Perlman's model are outlined below :

"A worker is structurally unemployed if he is unemployed and a job opening (vacancy) exists that he is not qualified to fill." ³

When vacancies exist and unemployed workers are qualified to fill some of these vacancies, the unemployed are considered frictionally unemployed. An unemployed worker can only be cyclically unemployed when the volume of unemployment is greater than the number of vacancies. The following notation is used :

U = total unemployment
V = total vacancies
s = structural
f = frictional
c = cyclical

Two situations can be distinguished : $U > V$; $V \geq U$. In the case of $U > V$, the following relationships apply :

$U = U_s + U_f + U_c$
 $V = U_s + U_f$
 $U_c = U - V$

The total level of structural unemployment can be measured by the total number of vacancies minus the unemployed who can fill

1. Ibid. pp. 20-21 .

2. R.Perlman, Labor Theory (John Wiley & Sons Inc.,1969), pp.168-76.

3. Ibid. p. 168 .

the vacancies (i.e. $U_s = V - U_f$).

In the case of $V \gg U$, we have :

$$\begin{aligned} U &= U_s + U_f \\ U_c &= 0 \end{aligned}$$

In this situation the total level of structural unemployment can be measured by the total number of unemployed less those who can fill the vacancies (i.e. $U_s = U - U_f$).

The measurement of structural unemployment, according to the model, involves the separation of structural from frictional unemployment on the basis of characteristics of both the unemployed workers and of unfilled vacancies. Accuracy - a true reflection of of the actual situation by reported data - and detail in unemployment and unfilled vacancy data are, thus, necessary for the measurement of structural unemployment.

Consider the measurement of structural unemployment on the basis of occupational classes. If $U_i > V_i$ for occupation i , then all the vacancies are matched by frictionally unemployed workers, and $U_i - V_i$ measures occupation i 's possible contribution to structural unemployment. For $U_i - V_i$ to contribute to structural unemployment there must be occupations for which $V_j > U_j$ (structurally over employed counterparts : SOC's). Given sufficient labour surpluses ($U_i - V_i$) an SOC will contribute $V_j - U_j$ to structural unemployment and vice versa.

Thus, the total volume of structural unemployment can be estimated, and the problem of separating structural from frictional unemployment can be avoided, by measuring the excess of vacancies over unemployment in the SOC's.

$$\text{i.e. } U_s = \sum_{j=1}^m (V_j - U_j)$$

This will measure the level of structural unemployment provided that it is less than $\sum_{i=1}^n (U_i - V_i)$ for the occupations in which $U_i > V_i$.

2.7 Unemployment-Vacancy Relationship : Empirical

Before the appearance of models proposing a vacancy-based classification of unemployment, empirical estimates of the degree of "maladjustment" in the labour market had been made for the U.K. economy. The pioneering study in this regard was that by Dow and Dicks-Mireaux (DDM)¹. Their study involved the use of data on unemployment and unfilled vacancies to construct a series on the excess demand for labour in Great Britain. The general principles underlying the DDM method² are outlined below with reference to figure 2.3 :

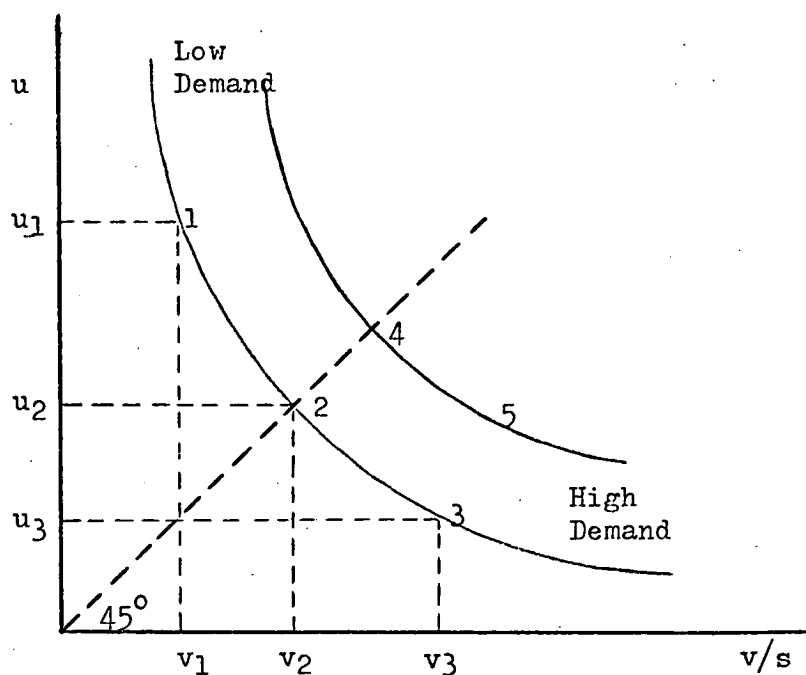


fig. 2.3

"Maladjustment" in the Labour
Market .

1.. J.C.R.Dow and L.A.Dicks-Mireaux, "The Excess Demand for Labour.

- (1) An estimate is required of the accuracy with which vacancies are stated : a ratio, s , defined as reported vacancies divided by true vacancies. The points 1,2,3,4,5 represent observed values of unemployment (u) and of vacancies (v) corrected for the statement error (v/s).
- (2) Zero net excess demand is defined as all points where unemployment equals true vacancies, i.e. the 45° line through the origin.
- (3) Successive points on the 45° line (e.g. points 2,4) represent different levels of maladjustment; the amount of maladjustment is measured as the amount of unemployment which exists at zero net excess demand (i.e. where $u=v/s$).
- (4) For any given level of maladjustment, there will be a series of points representing different levels of demand and these points will lie on a curve convex to the origin (e.g. for maladjustment of u_2 we have the points 1,2,3.
- (5) For positions of net excess demand, the best measure of demand is true vacancies less estimated maladjustment (e.g. at point 3 demand would be measured as $v_3 - u_2 = v_3 - v_2$). For positions of net deficient demand the measure of demand is maladjustment less unemployment (e.g. $u_2 - u_1$ for point 1).

The principles embodied in this early study are reflected in much later articles. Hagger¹ has applied the DDM method to Australian data. The method was applied to data for Australia as a whole, for each State and for males and females separately in each case. Hagger specifies the probable form of the relationship between u and v/s , for a given level of maladjustment (m) :

"...given m , a fall in u will be accompanied by a rise in v/s ; and a rise in u by a fall in v/s ; that is, u will be an ever-decreasing function of v/s , given m . However, since neither u nor v/s can fall below zero, the curve of the function will be of the type shown...it appears reasonable to assume that the relationship between u and v/s is a rectangular hyperbola, i.e. a relationship of the form :

$$m = \sqrt{uv/s} \quad \text{or :} \quad s = uv/m^2 \quad " \quad 2$$

A Study of Conditions in Great Britain, 1946-56", (Oxford Economic Papers, vol. 10, Feb. 1958), pp. 1-33.

2. Ibid. pp. 5,6.

1. A.J.Hagger, "The Excess Demand for Labour in Australia, 1948-63" (Economic Record, March, 1970), pp. 26-54.

2. Ibid. p. 30 .

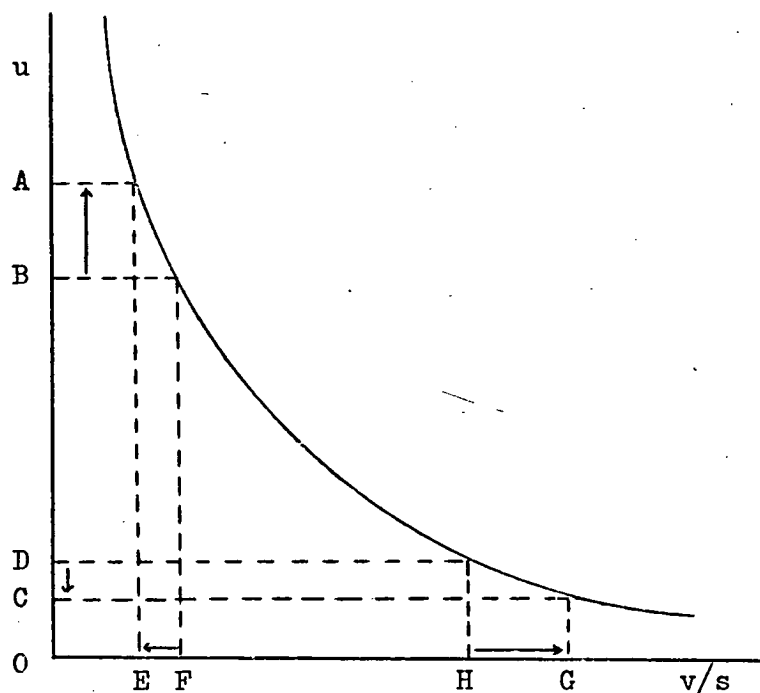


fig. 2.4

Relationship Between u & v/s

When the unemployment percentage, u , is high (e.g. OB) an increase in u such as from OA to OB will be associated with only a small decline in v/s (from OF to OE). For high unfilled vacancy percentages such as OH , an increase in v/s will be associated with a small decrease in u (from OD to OC).

With respect to the use of the DDM method to derive a series on the excess demand for labour, Hagger notes three sources of unreliability : firstly, the estimate of s may be incorrect; secondly, s could be a function of the demand for labour; and thirdly, s may have changed over time.

Neither Dow and Dicks-Mireaux nor Hagger explicitly estimated unemployment-vacancy relationships. Thirlwall¹ fitted arithmetically linear relationships of the form :

$$u = a + b.v$$

1. A.P.Thirlwall, Types of Unemployment, pp. 33-38.

He fitted this form of the relationship to data for the U.K. for the period 1949-66. The coefficient on b was negative and significant at the 1% level. He used the estimated relationship as a means of estimating non demand-deficient unemployment for the U.K. Thirlwall found that, on average, in the period 1949-66 there was no demand-deficient unemployment. The data used in the study were not adjusted for the statement error in the vacancy series. Thirlwall fitted unemployment-vacancy relationships for regions and industries as well as for the U.K. as a whole. The results indicated that there was a significant relationship between unemployment and unfilled vacancies for most sectors. There were significant differences in the non demand-deficient unemployment percentage as between industries, but not between regions.

Gujarati¹ studied the behaviour of unemployment and unfilled vacancies in Great Britain for the period 1958-71 and noted that something had happened to the neat "inverse parallelism" pattern as from the last quarter of 1966 : unemployment was rising relative to unfilled vacancies. That is, there was evidence of a shift in the unemployment-vacancy relationship. Gujarati tested relationships of the form :

$$\log u = b_0 + b_1 \log v + b_2 t \quad (t = \text{time})$$

Data for the period from the fourth quarter of 1958 to the third quarter of 1966 were used to estimate the $u-v$ relationship. The estimated equation was then used to predict the unemployment percentage for the period from the fourth quarter of 1966 to the

1. D.Gujarati, "The Behaviour of Unemployment and Unfilled Vacancies" (Economic Journal, March, 1972), pp. 195-204.

second quarter of 1971. Comparing actual with predicted unemployment, Gujarati concluded that a change in the u-v relationship, an upward shift, had taken place in the period 1966-68. He argued that the increase in unemployment relative to unfilled vacancies was the result of two legislative acts :

"Although these two acts were designed primarily to alleviate the hardships resulting from unemployment, an unintended consequence of these acts may be an 'artificial' increase in registered unemployment : an unemployed person is now under less pressure to look for a job immediately and may spend more time searching for a job." ¹

Gujarati's article drew a response. Foster ² challenged the results and the conclusion. In particular, he drew attention ^{to the fact} that inclusion of a rate of change of unemployment term affects the findings. Foster tested a relationship of the form :

$$\log u_t = a_0 + a_1 \log v_t + a_3 \log u_{t-1}$$

The results confirmed that a shift of the u-v relationship did occur in 1966, but the u-v curve continued to move outward after 1968. Foster notes that although the two Acts (Redundancy Payments Act; National Insurance Act) may have caused the observed shift, there are other plausible explanations such as demographic changes in the pattern of labour supply.

Taylor ³ also responded to Gujarati's conclusion, arguing that the demand side of the labour market had been neglected and that the observed upward shift of the u-v relationship resulted from a sharp fall in "labour hoarding" : an extraordinary shift of unused manhours from labour hoarding to registered unemployment. "Labour hoarding"...

1. Ibid. p. 195 .

2. J.L.Foster, "The Behaviour of Unemployment and Unfilled Vacancies: Great Britain, 1958-71-A Comment", (Economic Journal, March '73), p.192f.

3. J.Taylor, "The Behaviour of Unemployment and Unfilled Vacancies:

"...occurs when employed labour is not fully utilised. During a period of declining demand for labour, employers can adjust their input of labour services by reducing the number of employees on their books, and by reducing the average number of hours worked per employee. But the adjustment process takes time to work itself out...with the result that productivity per worker falls below its achievable short-run level." ¹

The most comprehensive attempt to analyse the reasons for the shift of the unemployment-vacancy relationship in the U.K. is presented in two articles by Bowers et al. ² They were particularly concerned with the change in the relationship between unemployment and earnings increases : the breakdown in the traditional form of the 'Phillips' relationship. When unfilled vacancies were substituted for unemployment in the 'Phillips' relationship there was no evidence of a break or shift. This led to an extensive examination of the relationship between unemployment and unfilled vacancies.

The method used by Bowers for determining the nature and timing of changes in relationships is outlined in the quotation below :

"The procedure reported on here is to specify the relationships as holding between the rate of change of earnings and, as independent variables, the level of and rate of change of unemployment and the rate of change of retail prices, and then to explore three hypotheses in respect of such a relationship :

- (i) the relationship shifted bodily (i.e. the constant term in the regression changed);
- (ii) the partial regression of the rate of earnings increase on unemployment changed (i.e. the slope of the 'Phillips curve' changed);
- (iii) Both (i) and (ii) occurred together.

Great Britain, 1958-71 - An Alternative View" (Economic Journal, Dec. 1972), pp. 1352-1365.

1. Ibid. p. 1354 .

2. J.K.Bowers, et al, (1)"The Change in the Relation Between Unemployment and Earnings Increases: A Review of Some Possible Explanations" (National Institute Economic Review, No.54, Nov.1970) pp.44-62; (2) "Some Aspects of Unemployment and the Labour Market, 1966-71" (N.I.E.R., No.62, Nov. 1972), pp. 75-88.

The technical device employed for exploring these three hypotheses is to introduce into the relationship as additional variables two dummies d_t (the 'shift' dummy) and d_{U_t} (the 'slope' dummy) having the value 0 before a certain date, and the value 1 thereafter. We experimented with different break-points for these dummy variables until we found the best statistical fit." ¹

The dating and nature of shifts in the unemployment-vacancy relationship were investigated using a method similar to that outlined above. The functional form relating u and v was found, by testing, to be a log-linear one :

$$\log u = a + b \cdot \log v + \text{seasonal factors}$$

$$b < 0$$

Relationships were estimated for Great Britain as a whole and for regions, industries and occupations separately. Time trends and dummy variables were introduced into the basic form of the relation. Various possible explanations of the shift in the relationship between unemployment and aggregate demand were investigated in Bowers (1). The conclusion of this first article was that there were a number of factors, such as regional policy, selective tax impositions, changes in the behaviour of quits by employed persons and devaluation, accounting for the change in the behaviour of unemployment and the relative importance of each factor was indeterminate.

In the second Bowers article, greater attention is given to the demand side of the labour market, particularly trends in output and productivity. Bowers (2) is primarily concerned with the unemployment-vacancy relationship rather than the earnings-unemployment relationship :

"The present article is basically an investigation of the change in the relationship between vacancies and unemployment...." ²

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1. Ibid. (1) p. 46 .
 2. Ibid. (2) p. 78 .

In Bowers (2) various possible explanations of the shift in the position of the unemployment-vacancy relationship were looked at : changes in the supply of labour, the age structure of the unemployed, voluntary quits and productivity. There was little evidence of a shift in the relation between changes in unemployment and labour turnover. Bowers also concluded that the evidence did not support a structural shift explanation (changes in relative unemployment rates). The overall conclusion was that, although supply shift explanations could not be ruled out, the major reason for the change in the unemployment-vacancy relationship was a demand shift :

"While we cannot rule out some supply side factors...it is difficult to see them as more than a partial explanation. They seem to have been swamped by a demand shift, and by other demand side factors taking the form, for example, of greater employer selectivity in hiring, and perhaps also by some change in the recording of vacancies...so far as the current level of unemployment is concerned there is little doubt that the slackness of aggregate demand in the economy is the major cause, together with an acceleration in the rise of labour productivity." ¹

The comprehensive theoretical and empirical analysis undertaken by Bowers, et al., served to emphasise and elucidate the multiplicity of possible causes of a change in the position of the unemployment-vacancy relationship. They also made a contribution in the area of the relationship between sectoral unemployment-vacancy relationships and the aggregate curve. This aspect is looked at more closely in the ensuing section.

2.8 Sectoral Unemployment-Vacancy Relationships

The aggregate unemployment-vacancy relationship can be thought of as a weighted average of sectoral unemployment-vacancy relation-

1. Ibid. (2) p. 88 .

ships, weighted according to sectors' shares in the labour force. As outlined in section 1.5, a change in the position of the aggregate unemployment-vacancy relationship can be caused by changes in the position of sectoral relationships, in the weighting of sectors in the labour force or in the distribution of demand between sectors. The effect of a redistribution of unemployment on the aggregate u-v relationship will depend on the difference between the weighted sum of the slopes of the u-v relationships in sectors where unemployment has increased and the weighted sum of the slopes of the u-v relationships in sectors where unemployment has decreased.

Bowers empirically estimated sectoral unemployment-vacancy relationships for industries, regions and occupations and tested for shifts in these relationships. Unemployment and unfilled vacancy percentages were available in the case of industries and regions and it was possible to compare the degree of the shift in the relationships as between sectors. The shifting of the unemployment-vacancy relationships was a fairly general phenomenon, although the extent of the shift varied considerably and in one or two cases the shift was in an opposite direction to the general trend.

In the Bowers analysis, the aggregate u-v curve is seen as a weighted average of the u-v relationships in a number of sub-markets. For a stable aggregate curve the implicit weightings attaching to the various sub-markets must be predictable. If the relationships between the sub-markets change, then there will be a shift in the position of the aggregate relationship. It is possible to examine the reasons for an aggregate shift by considering the relative unemployment levels in the various sectors of the labour

market, and changes therein, in addition to the behaviour of the sectoral unemployment-vacancy relationships. Bowers distinguishes two kinds of shift :

"A situation of pure structural shift is one where the U-V relationships in the various sub-markets remain stable, but the relative unemployment levels shift. A situation of pure supply or demand shift, on the other hand, would be characterised by stable unemployment relatives but shifting U-V curves in the sub-markets. One would expect the situation to be somewhere between these two extremes..."¹

The testing of occupational u-v relationships resulted in the rejection of the structural shift hypothesis : in all cases there was a certain degree of uniformity in the changes, a significant outwards shift of the unemployment-vacancy relationship as from late 1966. This result suggests that there was a generality with respect to the causal factors of the shift : the factors were operating on all classes and categories of workers. This conclusion was supported, in substantial part, by the results for regions and for industries.

2.9 Unemployment-Vacancy Relationship : Theoretical

The lack of a satisfactory time series on unfilled vacancies for the United States economy precluded the above empirical testing of the unemployment-vacancy relationship. American economists did, however, engage in considerable research on the theoretical determinants of the u-v relationship. The approach adopted involved a job search - labour turnover model of the labour market. This model permitted the tradeoff between unemployment and inflation within a labour market compartment to be derived from two behaviour based

1. Ibid. p. 83 .

labour market relationships :

- (1) A dynamic unemployment-vacancy relationship
- (2) A wage response relationship

The national Phillips relation is based on the aggregation of the above relationships for compartments. The scope of this study is limited to the unemployment-vacancy relationship. The derivation of this relationship is set out by Holt and his approach is outlined below.

The unemployment-vacancy relationship is assumed to depend on the interaction between labour turnover and the placement process.

The flow from employment arises from retrenchments, quits and other separations. This flow, T , responds to fluctuations in the vacancy-unemployment ratio with a small elasticity, r . The flow does not change much over the cycle because fluctuations in quits are largely offset by those in retrenchments, although quits are more volatile than retrenchments. The turnover flow, T , is given by :

$$T = f \left(\frac{V}{U} \right)^r E \quad \text{where}$$

U and V are the stocks of unemployment and unfilled vacancies respectively, f is a parameter reflecting the probability per period that an employee will be involved in the turnover flow and E is employment.

The size of the flow of new hires, H , into employment depends on the efficiency, h , of matching workers and vacancies. The more unemployed workers and the more unfilled vacancies, the greater the hire flow : but both are subject to diminishing returns reflected in the elasticity parameters, u and v , which are less than unity. The new hire flow is given by :

$$H = h.U^u.V^v$$

When employment is growing at a steady rate, g , then the expected inflow, H , into employment will approximately equal the outflow, T , plus $g.E$:

$$\text{i.e.} \quad H = T + g.E$$

Holt argues that because the flows through the unemployment, unfilled vacancy and employment stocks are large compared to the changes in the stocks, deviations from this equilibrium condition will normally not be great.

Combining the three equations presented above we have :

$$U^{(u+r)} V^{(v-r)} = \left[f/h + g/h(U/V)^r \right] E$$

Unemployment and unfilled vacancies will be high when the turnover flow parameter, f , is high, when growth is high, and when the efficiency of placement, h , is low.

This theoretical approach sought to make the relationship between flows in the labour market and the levels of unemployment and unfilled vacancies more explicit. The position of the unemployment-vacancy relationship will be a function of the general level of turnover in the labour force : unemployment and unfilled vacancies will be high whenever turnover is high. The stability of the $u-v$ relationship over the cycle is dependent on the assumption that labour turnover is cyclically fairly constant : changes in quits are largely offset by changes in retrenchments. A change in the response of one of the turnover flows to economic conditions would introduce instability in the relationship.

The relation between flows in the labour market and the position and stability of the unemployment-vacancy relationship is considered in the following two sections.

2.10 Flows in the Labour Market

The scope of the literature gradually expanded to include not only unemployment and unfilled vacancies as stocks, but also the relationship between these stocks and the dynamic nature of the labour market, particularly turnover in the labour force. There is constant movement of the population from one labour market status to another : workers are retrenched or quit their jobs, young people leave school and look for work, people retire and their jobs become vacant, married women leave the labour force for home responsibilities or enter to supplement family income. Labour turnover was regarded as the major cause of frictional unemployment, but did not receive a great deal of emphasis in the literature until the late 1960s and early 1970s.

Economists have generally accepted that some unemployment will always arise in the normal operation of the labour market. At full employment many of the unemployed are passing through stages in their careers at which it is normal to have a period of job search (e.g. school leavers)...

"Experienced workers may seek new jobs, either because they have exhausted the possibilities for training and advancement in their old jobs, or because technical progress or shifts in the composition of demand have eliminated their previous jobs. Unemployed individuals who are changing jobs may have been laid off, or may have quit in the belief that more favourable opportunities exist elsewhere." ¹

Unemployment that arises from these sources may not present a social problem, provided the unemployed find jobs fairly quickly. Labour markets could not operate efficiently if workers did not spend part of their time in job search.

1. R.E.Hall, "Why is the Unemployment Rate So High at Full Employment?" (Brookings Papers on Economic Activity, 3 , 1970) p.388.

Stoikov¹ looked at the determinants of frictional unemployment with the emphasis on compositional changes in demand as the causal factor. He noted that the level of frictional unemployment depends on the gross flow of workers into employment (accessions) and the length of time that precedes each accession. It is possible for frictional unemployment to increase in two ways even if workers are re-employed at the same rate (accessions) at which they are displaced (separations). The displacement and re-employment rate may both increase by the same amount; the length of time spent in job searching before each accession may rise. Stoikov argued that the flows in the labour market depended on shifts in the demand for labour and autonomous flows of labour.

There was a need to develop a model of the labour market to clarify the relationship between the flows in the labour market and the stocks of unemployment and unfilled vacancies. Holt attempted to do this by presenting a diagrammatic outline of workers and jobs.² His diagrammatic representation, with minor revisions, is outlined in figure 2.5 below.

Unemployment is viewed as a transitory state through which most workers pass rather than an experience suffered only by a few groups of persons. The aggregate demand for goods and services, as manipulated by fiscal and monetary policy, determines production which generates manpower requirements. If the manpower requirements exceed the manpower available from the current stock of employment, then new job vacancies are created. If manpower requirements fall short of available manpower, then retrenchments occur and workers

1. V.Stoikov, "Some Determinants of the Level of Frictional Unemployment : a Comparative Survey" (International Labour Review, May 1966), pp. 530-549.

2. C.C.Holt, "Improving the Labor Market Tradeoff between Inflation

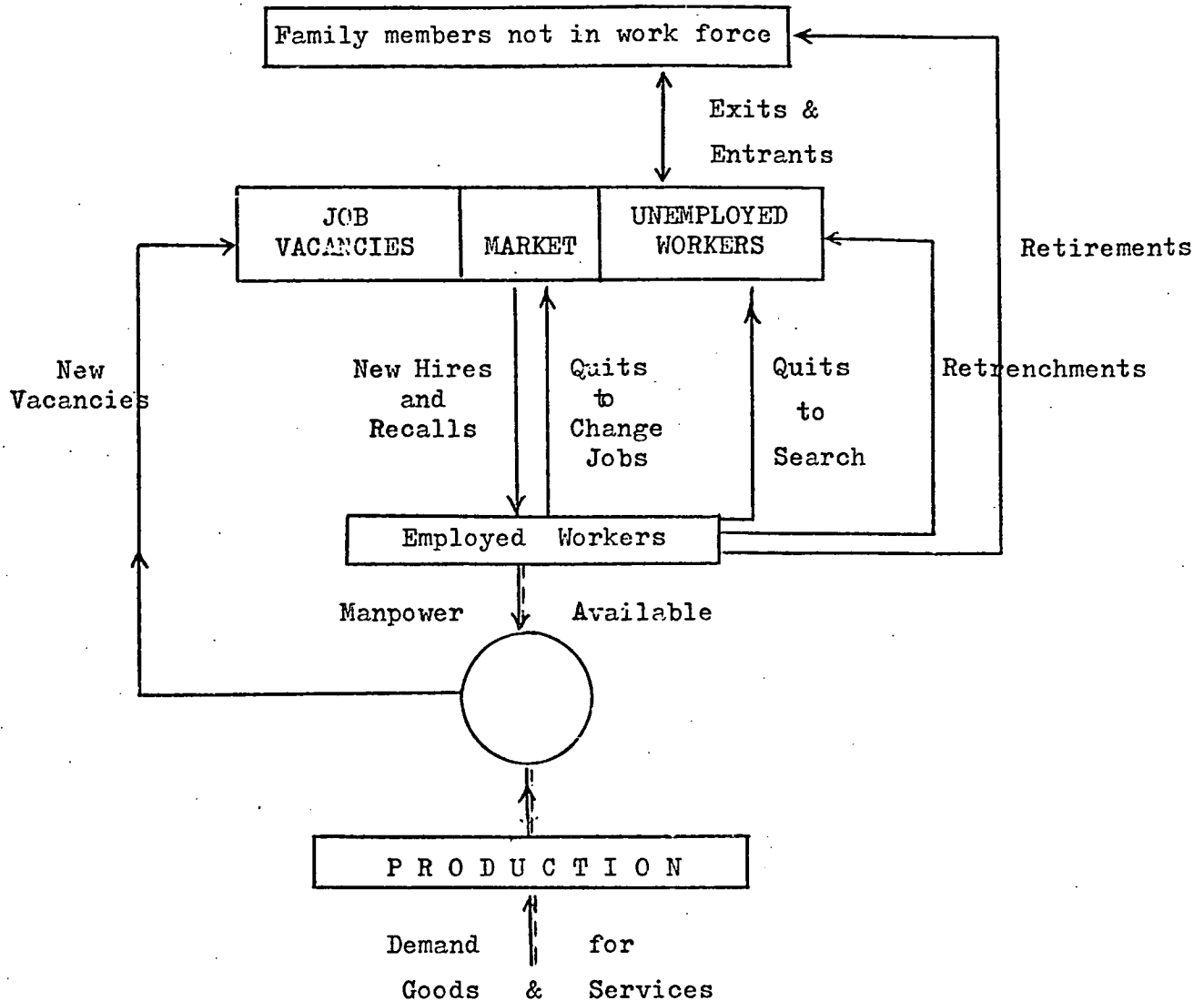


Figure 2.5

Flows and Stocks of Workers and Jobs

flow from the category of employed to unemployed, reducing one stock and adding to another. The levels of vacancies and unemployment influence hires and recalls.

Worker decisions to terminate their employment generate labour turn-over flows : searching for better jobs whilst employed and then quitting to change jobs without being unemployed, quitting to search for another job, retiring from the labour force.. For various domestic, economic and educational reasons family members are continually entering and leaving the labour force.

Holt estimates, for the United States, "rough and rounded" figures for the parameters of his model. Unemployed persons and vacancies wait approximately a month on average before finding work or employees. Turnover rates are in the vicinity of 3 to 4 per cent of employment per month. The stock of unemployed persons is replaced each month on average. Holt concludes that it is high turnover, generated by both employers and workers, coupled with the heterogeneity of jobs and members of the labour force which leads to the time-consuming search for new matches, that in turn accounts for the stocks of unemployed persons and unfilled vacancies.

An Australian article by Wilson¹ analyses unemployment from the viewpoint of labour turnover. He emphasises that in any analysis of its behaviour, unemployment should be regarded as a flow, although it is generally measured as a stock. Between the points of time used to measure unemployment there are four flows tending to change the level of unemployment :

- (1) from not in the labour force into unemployment
- (2) from employment into unemployment
- (3) from unemployment into employment
- (4) from unemployment into not in the labour force

Wilson identifies four sources of unemployment :

- (1) Retrenchments - terminations of employment by employers as a result of reduced production, completion of job, etc.
- (2) Transferant Separations - terminations of employment by employees in order to engage in job search or to take up a new job.
- (3) Dismissals - terminations of employment by employers for disciplinary reasons.
- (4) Entrances to the Labour Force - new entrances or re-entrances to the labour force.

1. D.F.Wilson, "Unemployment Flows and the Level of Business Activity", (CEDA Growth 20, 1969).

The above are the flows into unemployment. There are two flows in the other direction - "unemployment outlets" :

- (5) Engagements - gross additions by employers to their work forces.
- (6) Exits from the Labour Force - departure of unemployed persons from the labour force.

These flows will determine the change in the unemployment stock as between any two points in time...

"The change in the stock of unemployment between any two points in time will be given by the sum, for the period, of the numbers of persons joining each of the four source categories of unemployment minus the sum of the numbers of persons joining the two outlet categories." ¹

Wilson also considered variations in the flows over the cycle of employment and income and made a priori assertions regarding the cyclical sensitivity of the various flows. For example, retrenchments would be high in times of falling and low activity. Transferant separations will be high when vacancies are plentiful; in times of recession the prospects of alternative employment are low and workers will be reluctant to leave their employment except to actually take up another job. Dismissals will be substantially insensitive to the demand for labour, but may be low in periods of high demand when labour is scarce. A period of high demand for labour will be reflected directly in a high level of engagements and this will induce an high level of entrances to the labour force. Some exits from the labour force will be for personal reasons and will not be greatly affected by the demand for labour. Exits could increase in periods of low demand for labour as a result of disillusionment with respect to lack of job opportunities.

1. Ibid. p. 31 .

The importance of labour turnover in the analysis of unemployment lies in the fact that small changes in the size of flows through the labour market can have a large impact on the stocks of unemployed persons and unfilled vacancies. In studies concerning the relation between unemployment and flows in the labour market, attention has been focussed on two variables : the incidence of unemployment and the duration of unemployment.

2.11 Duration and Incidence of Unemployment and Unfilled Vacancies

The separation of unemployment into one component related to turnover in the labour force and another component related to the duration of unemployment has been approached in a number of ways. Some of these approaches are outlined below. A similar treatment is accorded to the stock of unfilled vacancies and this is also considered.

Holt¹ looked at this aspect within the context of his dynamic, job search based, model of the labour market. The stock of unemployment is determined by the flow of hires (engagements) and turnover. Let T_s be the mean search time : the time that it takes for an unemployed person to locate a suitable vacancy through a random search process and find sufficient mutual interest to lead to an interview. Let P_{oa} be the average probability that such interviews will result in job offers and acceptances. The probability per period of time that an unemployed person will be placed is proportional to the number of unfilled vacancies : i.e. $P_{oa}.V/T_s$. The total flow of new hires, F , depends on the above probability multiplied by the number of unemployed persons, U :

$$\text{i.e. } F = P_{oa}.V.U / T_s$$

1. C.C.Holt, "Improving the Labor Market Tradeoff", pp. 137,138.

Solving for the stocks of unemployment and unfilled vacancies we have :

$$U.V = F.T_s / P_o a$$

The stock of unemployment will continue to grow until the new hire rate is equal to the flow of quits, retrenchments and retirements : that is, the turnover rate determines F . Holt[†] argues that the right-hand side of the above equation is stable over the cycle and that, therefore, U and V move cyclically in opposite directions. The average durations of unemployment, T_u , and of unfilled vacancies, T_v , are found by dividing the stocks by the flows :

$$\text{i.e. } T_u = U / F ; T_v = V / F$$

$$U = T_u.F ; V = T_v.F$$

Holt further argues that F fluctuates little cyclically and, thus, the duration of unemployment is high when unemployment is high and similarly for unfilled vacancies. Unemployment duration will tend to rise cyclically when vacancy duration falls and vice versa. Most of the cyclical variation in unemployment and unfilled vacancies will be the result of changes in the duration of unemployment and unfilled vacancies.

The analysis of unemployment by duration is useful in elucidating the nature of the unemployment that remains at full employment. For example, unemployment may be the result of a large number of persons experiencing short spells of unemployment or a smaller number of persons out of work almost permanently (long-term unemployment). Data on unemployment by duration can assist in determining the relative roles of these factors.

Hall¹ analysed U.S. data on unemployment by duration and found that, at full employment, very few individuals remain unemployed for more than a few months. He concludes that unemployment is high at full employment because the natural flow of workers through the labour market is high and because some groups in the labour force do not follow definite careers but change frequently from one job to another and experience unemployment with most changes.

In a later article² Hall uses data on the number of spells and the number of weeks of unemployment reported by individuals to estimate the probability that an individual will become unemployed in a given week if not unemployed, or that he will leave unemployment if already unemployed. These results can be used to break down the unemployment percentage into a component of frequency, measured as the probability of becoming unemployed, and duration, measured as the inverse of the probability of leaving unemployment. Hall developed a model of turnover based on a probability, α , that a worker who is not unemployed in one week will be so the next week, and another probability, β , that a worker who is unemployed one week will not be unemployed the next week. The first probability measures the frequency of unemployment and the second is inversely related to the duration of unemployment.

Assuming that the unemployment percentage³ is the same from one week to the next, it has the following relationship to α and β :

$$u = \alpha(1 - u) + (1 - \beta)u$$

Of the proportion of the population not unemployed last week, $(1 - u)$ have just become unemployed; of the proportion, u , unemployed

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1. R.E.Hall, "Turnover in the Labour Force" (Brookings Papers on Economic Activity, no.3 1972) pp. 709-756.
 2. R.E.Hall, "Why is the Unemployment Rate So High", pp.369-402.
 3. In this case, unemployment as a percentage of population of working age.

last week, $(1 - \beta)$ remain unemployed. The above equation can be solved for u :

$$\text{i.e. } u = \frac{\lambda}{\lambda + \beta}$$

Kaitz¹ also analysed data on unemployment by duration with a view to estimating the length of spells of unemployment. He looked at the distribution of unemployment by duration under relatively stable conditions in relation to one's chances of leaving the ranks of the unemployed. The probability of ^{not} leaving unemployment is termed the "continuation rate" : the probability that a person unemployed for n weeks will remain unemployed for an additional week. He also noted the duration and turnover components of unemployment :

"Total unemployment (u) is equal to the product of the number of new spells (us) and the average duration per spell ($100/s$). Consequently, small percentage changes in the unemployment rate from one period to another are approximately equal to the sum of the percent changes in the number of new spells and in the length of the average spell." ²

Fowler³ analysed data on the duration of unemployment for the United Kingdom. He viewed the register of wholly unemployed as a population constantly increased by unemployed persons coming on to the register and depleted by persons leaving the register. The model was based on the probabilities of remaining on or leaving the register. His findings are summarised in the quotation below :

"...it is clear that a very large proportion of the total days lost through unemployment...is attributable to a small proportion of persons on the register. An important part of the register consists of a large number of persons moving from one job to another and remaining on the register only for a short time." ⁴

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1. H.B.Kaitz, "Analyzing the Length of Spells of Unemployment" (Monthly Labor Review, Nov. 1970), pp.11-20.
 2. Ibid. p. 14 .
 3. R.Fowler, Duration of Unemployment on the Register of Wholly Unemployed, (London : H.M.S.O. 1968).
 4. Ibid. p.7 .

Fowler noted that the small number of persons who remain on the register for long periods are mainly older persons and others who, for various reasons, are difficult to employ. Unemployment could be reduced if those persons coming onto the register who are likely to stay on for a long time could be identified at an early stage so that necessary steps (e.g. retraining, relocating) could be implemented quickly. Short-period unemployment could be reduced by measures designed to make mobility and change easier.

Flanagan¹ looked into reasons why the U.S. unemployment percentage, even after allowing for definitional differences, was higher than that of other industrialised countries. This included analysis, both theoretical and empirical, of the incidence and duration of unemployment. He related the incidence and duration of both unemployment and unfilled vacancies to the unemployment-vacancy relationship :

"...the parameters of the UV relation reflect the speed and extent of adjustment of actual to potential employment and actual to potential labour supply when the labor market is in disequilibrium. The study of this process is facilitated by disaggregating the stocks of unemployment and job vacancies into the flow per unit of time and average duration of each variable. Thus, the job vacancy and unemployment rates can be defined

$$V = Iv.Dv ; U = Iu.Du$$

i.e., as the product of the weekly incidence of new unfilled vacancies (unemployment) as a percentage of the labor force and the average number of weeks such vacancies remain unfilled (individuals remain unemployed). The identities define a steady state in which the weekly flows of new vacancies and new unemployment exactly match and replace the vacancies and unemployment generated (on average) Dv and Du weeks earlier." ²

Flanagan proceeded to outline the determinants of the incidence of unfilled vacancies and unemployment. The rate of incidence

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1. R.J.Flanagan, "The U.S. Phillips Curve and International Unemployment Rate Differentials" (American Economic Review, vol. 63, No.1, March 1973), pp. 114-131.
 2. Ibid. p. 115 .

of vacancies is defined as :

$$I_v = q(Q) + y(Q) + r + \Delta E^*(Q)$$

This is for the case when desired employment exceeds actual employment. In the above equation q is the quit rate,¹ y the retrenchment rate, r the retirement rate, ΔE^* is the change in desired employment as a percentage of employment, and Q is excess demand in the product market.

The rate of incidence of unemployment is defined as :

$$I_u = \alpha q(Q) + \beta y(Q) + \gamma p(Q)$$

In this equation p is the rate of gross labour force entrance, and α , β and γ are parameters reflecting the propensity of each source of turnover to incur unemployment.

Empirical evidence suggests that the quit rate is directly related to the excess demand for labour while the retrenchment rate is inversely related thereto. The disequilibrium behaviour of I_v and I_u will depend on the relative cyclical elasticity of quits, retrenchments and entrants as well as the proportion of quits, retrenchments and labour force entries involving unemployment. Flanagan argues that most of the cyclical variation in unfilled vacancy and unemployment rates is due to changes in the average duration of vacancies and unemployment. The duration of vacancies is positively, and of unemployment is negatively, related to excess demand in the product market. The relationship between labour turnover, duration and the unemployment-vacancy relation is summarised by Flanagan :

"...the slope of the UV relation depends critically on the cyclical sensitivity of quits, layoffs, and labor force entrants, the proportion of each turnover flow

1. The term "rate" refers to the flow expressed as a percentage of employment.

which incurs unemployment, and the cyclical behaviour of the duration of vacancies and unemployment...the position of the uv curve is also a function of the general level of turnover in the economy." ¹

The general form of Flanagan's approach to the analysis of turnover in the labour force will be followed in this study.

2.12 Manpower Policy

The term "manpower policy" or "labour market policy" refers to those policies that operate directly in the labour market with respect to facilitating the employment of workers with a view to reducing the level of unemployment. The term "manpower policy" is the more common in the literature and will be used in this study. Manpower policy is only indirectly relevant to the analysis and is only briefly considered in this section.

Interest in manpower policy arose during the debate between structuralists and aggregate demand theorists. Some manpower policies (e.g. retraining schemes, youth corps) were introduced in the U.S. in the mid 1960s. Support for the implementation of manpower policies derived in part from the successful operation of such policies in Scandinavian countries, particularly Sweden. Olsson² outlined the general scope of manpower policy, which includes measures to :

- (1) Stimulate geographic mobility
- (2) Improve vocational mobility
- (3) Influence the location of industries
- (4) Encourage the employment of the physically and mentally handicapped
- (5) Create new job opportunities during seasonal and cyclical fluctuations and within special regions
- (6) Suppress excess demand in particular sectors
- (7) Give information, including vocational guidance and service, and to do so more quickly.

1. Ibid. pp. 116-117.

2. B.Olsson, "Labour Market Policy in Modern Society : With Particular Reference to Marginal Manpower Groups" in R.A.Gordon, ed. Toward a Manpower Policy, (John Wiley & Sons Inc. 1967).

The effectiveness of manpower policy is dependent on an efficient employment service widely distributed geographically and with a number of labour market tools at its disposal. Once having identified a manpower problem in a particular sector of the labour market it is necessary to select and implement a policy which will influence the sector concerned without adversely affecting other sectors in the labour market. There is a need for a wide range of potential policies to meet the diverse needs of labour force groups. The supplementary problem is to integrate the various manpower policies into a unified manpower policy. The maintenance of full employment is a prerequisite to the successful implementation of manpower policy.

Holt¹ has made recommendations on manpower policies based on his theoretical view of the operation of labour markets. The types of policies proposed include those that improve both the speed of matching workers and jobs and the quality of the matches, those that reduce turnover in groups where it is particularly high (especially young people), those that increase the supply of workers in markets where labour shortages exist and those that attempt to break down institutional barriers between labour markets (e.g. union entry restrictions). Holt estimated the costs and benefits associated with the implementation of the policies proposed.

The objective of this study is to provide an analysis of unemployment which will assist in the evaluation of manpower policy for Australia. The next chapter presents an analytical framework which embodies and integrates many of the concepts and methods outlined in the review of the literature.

1..C.C.Holt, et al, "Manpower Proposals for Phase III", (in Brookings Papers on Economic Activity, 3 , 1971), pp. 703-734.

CHAPTER 3

ANALYTICAL FRAMEWORK

3.1 Introduction

The objective of the thesis is to analyse unemployment in the Australian labour market, particularly non demand-deficient unemployment. To undertake such an analysis it is necessary to clarify the key variables which influence unemployment and the relationship between each of these variables and unemployment. Section 3.2 presents an outline of the aggregate labour market and is concerned not only with unemployment at a particular point in time, but also with the behaviour of unemployment over time. This involves consideration of changes in the relationship between unemployment and other labour market variables through time and this aspect is looked at in section 3.3.

The key relationship is that between unemployment and unfilled vacancies : the unemployment-vacancy relationship. Since this relationship has been discussed in section 1.3, section 3.4 concentrates on the method of testing for changes in the position of the relationship. Non demand-deficient unemployment is determined by the position of the unemployment-vacancy relationship and the statement error in the unfilled vacancies data. Section 3.5 outlines the method proposed for estimating the statement ratio.

Sections 3.6 and 3.7 are concerned with the aggregative determinants of non demand-deficient unemployment. Firstly, in section

3.6 the relationship between flows in the labour market and the position of the unemployment-vacancy relationship is outlined. In section 3.7 the impact of supply and demand factors on the u-v relationship is analysed.

The link between changes in sectoral and the aggregate unemployment-vacancy relationships has been outlined in section 1.5. Section 3.8 outlines the procedure for estimating sectoral unemployment-vacancy relationships and testing for changes therein. Section 3.9 looks at sectoral determinants of non demand-deficient unemployment supplementary to the sectoral unemployment-vacancy relationships.

3.2 An Outline of the Aggregate Labour Market

A diagrammatic outline of key labour market variables and the relationship thereof to unemployment is presented in figure 3.1. The variables and notation used are :

- P : Population of working age (fifteen years and over)
- A : Participation rate - the proportion of the population of working age who are in the labour force.
- L : Labour force - the supply of labour
- U : Unemployment - the number of persons unemployed
- E : Employment - the number of persons employed
- V : Number of unfilled vacancies
- E* : Demand for labour
- Q : Labour productivity - output per person employed
- Y : Aggregate demand for goods and services

3.2.1 Supply of Labour

The population of working age can be taken as given at any particular point in time. Changes in the population over time depend on natural increase and net migration. The population can be dichotomised into those who are in the labour force and those who are not. The participation rate is defined as the proportion of the population of working age who are in the labour force.

$$\text{i.e. } A = L / P$$

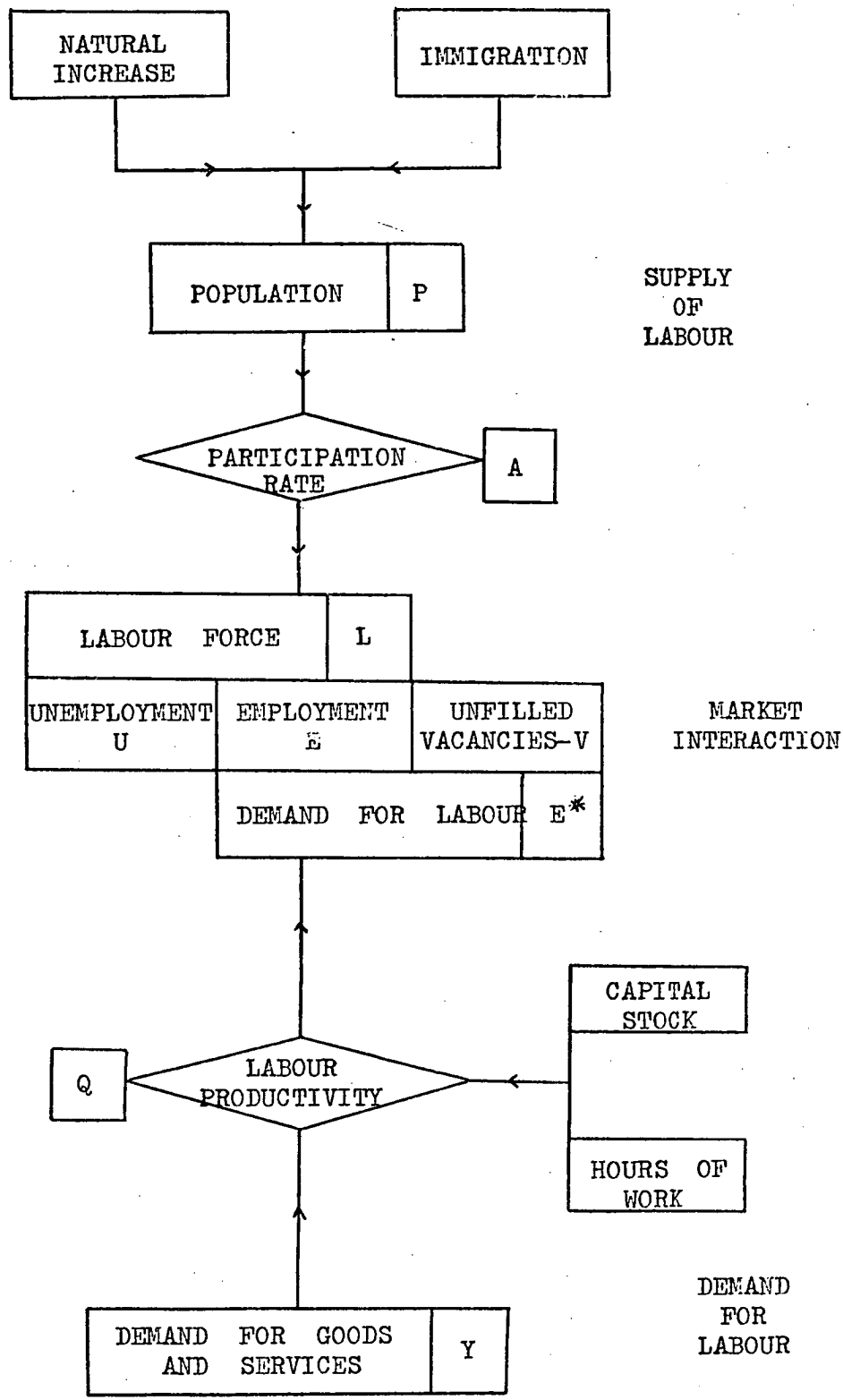


figure 3.1

Aggregate Labour Market

The participation rate will be a function of various economic and social factors such as the demand for labour, the level and structure of wages, family size, other sources of family income and social attitudes towards the working of married women.

Thus, the supply of labour is determined by the size of the population of working age and the participation rate.

$$\text{i.e. } L = A \cdot P \quad (3.2.1)$$

The total labour force, supply of labour, may be classified into those who are employed (have a job) and those who are unemployed (are seeking a job).

$$\text{i.e. } L = E + U \quad (3.2.2)$$

3.2.2 Disguised Unemployment

For the purposes of this sub-section the following additional variables are defined :

- N : Persons in the population but not in the labour force
- A* : Participation rate at full employment ($U = V$)
- N* : Persons in the population but not in the labour force at full employment
- L* : Potential labour force - labour supply at full employment
- D : Disguised unemployment - difference between actual and potential labour force

The number of persons in the population of working age but not in the labour force is equal to the population less the number in the labour force.

$$\text{i.e. } N = P - L$$

The total population may be classified into three categories : those not in the labour force; in the labour force and employed; in the labour force and unemployed.

$$\text{i.e. } P = N + E + U$$

There is a further category of persons in the population. At any time there may be persons in the population who do not have a job and who are not actively seeking employment (a necessary condition for being unemployed), but who would seek employment if jobs were more readily available (i.e. if the demand for labour increased). Such persons are termed "discouraged workers" and comprise a group referred to as "hidden" or "disguised" unemployment. The potential labour force may be defined to include this group.

$$\text{i.e. } L^* = A^* \cdot P \quad (3.2.3)$$

$$\text{i.e. } L^* = E + U + D \quad (3.2.4)$$

The amount of disguised unemployment is given by the difference between the potential and actual labour supply.

$$\text{i.e. } D = L^* - L$$

$$\text{i.e. } D = A^* \cdot P - A \cdot P$$

$$\text{i.e. } D = (A^* - A) \cdot P \quad (3.2.5)$$

The total population may be classified into four components : those not in the potential labour force; in the labour force and employed; in the labour force and unemployed; and those who are not in the labour force, but who would be at full employment.

$$\text{i.e. } P = N^* + E + U + D \quad (3.2.6)$$

3.2.3 Demand for Labour

The demand for labour is a derived demand - derived from the aggregate demand for goods and services. The demand for labour associated with a given level of aggregate output will depend on three factors : the size of the capital stock, average hours worked by employed persons and the productivity of labour resources (output per person employed).

It is assumed that the capital stock and average hours worked are fixed. Variations in the capital employed in the production process and in average hours worked will be reflected in the behaviour of labour productivity. The productivity of labour per person employed is given by :

$$Q = Y / E$$

Changes in the demand for goods and services will be reflected by changes in either employment or the productivity of labour, or some combination of both, since aggregate output is the product of these two variables.

$$\text{i.e. } Y = Q \cdot E \quad (3.2.7)$$

The demand for labour will give rise to some jobs for which workers can not be, or have not as yet been, found resulting in unfilled job vacancies. Thus, the demand for labour may be classified into two components : satisfied demand - employment (E) ; and unsatisfied demand - unfilled vacancies (V).

That is, the demand for labour is equal to the sum of these two components.

$$\text{i.e. } E^* = E + V \quad (3.2.8)$$

3.2.4 Market Interaction

Two additional variables are defined for the purpose of this section :

- U_{DD} : Demand-deficient unemployment
- U_{ND} : Non demand-deficient unemployment

The demand for labour interacts with the supply of labour in the labour market. The interaction is that between persons offering

their labour and employers offering jobs. Some labour that is offered is not matched with suitable jobs and results in unemployment. Some jobs that are offered do not attract suitable labour and this results in unfilled vacancies. Equilibrium in the labour market (full employment) is represented by the point at which the demand for labour is equal to the supply of labour.

$$\text{i.e. } E^* = L$$

$$\text{i.e. } E + V = E + U$$

$$\text{i.e. } V = U$$

This point represents full employment in that there are as many jobs as workers available. The amount of unemployment at this point is non demand-deficient unemployment. Demand-deficient unemployment is zero at full employment and can be either positive or negative at other levels of demand for labour. Total unemployment at any time will consist of two components :

$$\text{i.e. } U = U_{ND} + U_{DD} \quad (3.2.9)$$

At the point of full employment as defined above the potential labour force will equal the actual labour force and the amount of disguised unemployment will be zero.

3.3 Changes in the Labour Market Over Time

The subscript t attached to a variable denotes the value of that variable in period t . In analysing the behaviour of the labour market over time it is necessary to consider rates of change in labour market variables and for this reason the following rates of change are defined :

$$p_t = (P_{t+1} - P_t) / P_t$$

$$a_t = (A_{t+1} - A_t) / A_t$$

$$l_t = (L_{t+1} - L_t) / L_t$$

$$l'_t = (L_{t+1} - L_t) / E_t$$

$$y_t = (Y_{t+1} - Y_t) / Y_t$$

$$q_t = (Q_{t+1} - Q_t) / Q_t$$

$$e_t = (E_{t+1} - E_t) / E_t$$

$$e_t^* = (E_{t+1}^* - E_t^*) / E_t$$

The time series of unemployment and unfilled vacancies are subject to a large degree of cyclical variation relative to the means of the series. In looking at the behaviour of the time series on unemployment and unfilled vacancies it is appropriate to focus attention on these variables as a percentage of some other variable such as the labour force in order to adjust for growth in the labour market. There are three possible denominators for the deflation of the time series on unemployment and unfilled vacancies : the labour force (L), employment (E) and the demand for labour (E^*).

Usually, the labour force (L) is used as the denominator for the data series on unemployment to make it comparable over time in a growing economy. The demand for labour (E^*) would seem to be the most appropriate base for the unfilled vacancies series. In order to standardise the procedure as between the two series, employment (E) will be used as the denominator. The use of employment has the advantage that other variables in the labour market (e.g. labour turnover) are typically expressed as percentages of employment. Provided unemployment and unfilled vacancies comprise only a small proportion of the labour force and the demand for labour respectively (say, less than 3-4 per cent) the differences in the percentages using the different bases is small.

The following percentages are defined :

Unemployment percentage	: $u_t = U_t / E_t$
Unfilled vacancies percentage	: $v_t = V_t / E_t$
Disguised unemployment percentage	: $d_t = D_t / E_t$
Non demand-deficient unemployment	: $u_{nd_t} = U_{ND_t} / E_t$
Demand-deficient unemployment	: $u_{dd_t} = U_{DD_t} / E_t$

There are two possible ways of expressing the rate of change over time in the above percentages. For example, for unemployment we have :

Percentage change	: $\dot{u}_t = (u_{t+1} - u_t) / u_t$
First difference	: $\ddot{u}_t = (u_{t+1} - u_t)$

3.3.1 Methodological Note

Consider a variable, A , whose value is the product of two other variables, B and C. The value of A at times t and t+1 is given by :

$$A_t = B_t \cdot C_t$$

$$A_{t+1} = B_{t+1} \cdot C_{t+1}$$

Now, the difference between A_{t+1} and A_t is as below :

$$A_{t+1} - A_t = B_{t+1} \cdot C_{t+1} - B_t \cdot C_t$$

$$= B_t(C_{t+1} - C_t) + C_t(B_{t+1} - B_t) + (B_{t+1} - B_t)(C_{t+1} - C_t)$$

For small changes in the variables B and C relative to their absolute levels, the first two terms on the right-hand side will dominate the expression and provide an approximate distribution of the total variation in A between the two variables. The total change in the dependent variable A will not be distributed, but the terms will

give an indication of the effect of changes in each of the variables.

We have :

$$A_{t+1} - A_t \approx B_t(C_{t+1} - C_t) + C_t(B_{t+1} - B_t) \quad (3.3.1)$$

Dividing both sides of the above expression by $A_{t+1} - A_t$ means that the two terms on the right-hand side will give the approximate proportionate share of each variable in the total change. Further, since $A_t = B_t \cdot C_t$, we have :

$$\begin{aligned} (A_{t+1} - A_t) / A_t &\approx (B_{t+1} - B_t) / B_t + (C_{t+1} - C_t) / C_t \\ \text{i.e. } a_t &= b_t + c_t \quad (\text{approximately}) \end{aligned} \quad (3.3.2)$$

3.3.2 Changes in the Supply of Labour

There are two sources of change in the labour force over time : changes in the population of working age (P) and changes in the participation rate (A). Changes in P depend on the demographic composition of the population (the number of persons entering and leaving the working age bracket) and the net migration of persons of working age. The analysis in this study is restricted to changes in the population of working age in total. Similarly, the determinants of the participation rate are not analysed. Now, from 3.2.1 we have :

$$L_t = A_t \cdot P_t ; \quad L_{t+1} = A_{t+1} \cdot P_{t+1}$$

From equation 3.3.1 :

$$L_{t+1} - L_t = A_t(P_{t+1} - P_t) + P_t(A_{t+1} - A_t) \quad (3.3.3)$$

From equation 3.3.2 :

$$l_t = p_t + a_t \quad (3.3.4)$$

That is, the rate of change in the labour force over time is equal to the rate of change in the size of the population, which will normally be positive in a growing economy, plus the rate of change in the participation rate (which may be either positive or negative).

Another method of analysing changes in the supply of labour is through equation 3.2.2. We have :

$$L_t = E_t + U_t ; \quad L_{t+1} = E_{t+1} + U_{t+1}$$

$$\text{i.e.} \quad L_{t+1} - L_t = (E_{t+1} - E_t) + (U_{t+1} - U_t)$$

$$\text{i.e.} \quad (L_{t+1} - L_t)/E_t = (E_{t+1} - E_t)/E_t + (U_{t+1} - U_t)/E_t$$

Now, for small changes in E between t and t+1, U_{t+1}/E_t is approximately equal to u_{t+1} (i.e. U_{t+1}/E_{t+1}). Therefore :

$$l_t^! = e_t + u_{t+1} - u_t \quad (3.3.5)$$

(Note that for small u_t , $l_t^!$ is approximately equal to l_t)

3.3.3 Changes in the Potential Labour Force

It is possible to analyse changes in the potential labour force using equation 3.2.3. We have :

$$L_t^* = A_t^* \cdot P_t ; \quad L_{t+1}^* = A_{t+1}^* \cdot P_{t+1}$$

From equation 3.3.1 :

$$L_{t+1}^* - L_t^* = A_t^*(P_{t+1} - P_t) + P_t(A_{t+1}^* - A_t^*) \quad (3.3.6)$$

From equation 3.3.2 :

$$l_t^* = a_t^* + p_t \quad (3.3.7)$$

(where $a_t^* = (A_{t+1}^* - A_t^*)/A_t^*$

$p_t = (P_{t+1} - P_t)/P_t$)

It is also possible to analyse changes in the potential labour force through changes in employment, unemployment and disguised unemployment. From equation 3.2.4 we have :

$$L_t^* = E_t + U_t + D_t ; \quad L_{t+1}^* = E_{t+1} + U_{t+1} + D_{t+1}$$

Therefore,

$$L_{t+1}^* - L_t^* = (E_{t+1} - E_t) + (U_{t+1} - U_t) + (D_{t+1} - D_t) \quad (3.3.8)$$

Dividing through by E_t and approximating U_{t+1}/E_t to u_{t+1} and D_{t+1}/E_t to d_{t+1} , we have :

$$l_t^* = e_t + (u_{t+1} - u_t) + (d_{t+1} - d_t) \quad (3.3.9)$$

(where $(L_{t+1}^* - L_t^*)/E_t$ is assumed to equal l_t^*)

Changes in disguised unemployment as between t and $t+1$ reflect a difference in the rates of change in the potential and actual labour forces. That is :

$$d_{t+1} - d_t = l_t^* - l_t$$

3.3.4 Changes in Unemployment

Changes in the unemployment percentage over time result from the labour force increasing or decreasing at a different rate to employment. From equation 3.2.2 we have :

$$U_t = L_t - E_t ; \quad U_{t+1} = L_{t+1} - E_{t+1}$$

$$\text{i.e. } U_{t+1} - U_t = (L_{t+1} - L_t) - (E_{t+1} - E_t) \quad (3.3.11)$$

Dividing through by E_t we have :

$$(U_{t+1} - U_t) / E_t = (L_{t+1} - L_t) / E_t - (E_{t+1} - E_t) / E_t$$

$$\text{i.e. } u_{t+1} - u_t \approx l_t^* - e_t \quad (3.3.12)$$

(assuming $u_{t+1} = U_{t+1}/E_t$)

Provided unemployment is small relative to employment, l'_t is approximately equal to l_t . For the unemployment percentage to be constant over time it is necessary for the rate of change in the labour force to equal the rate of change in employment. That is, simply :

$$l'_t = e_t \quad (\text{for } u_{t+1} - u_t = 0) \quad (3.3.13)$$

The unemployment percentage will increase if the labour force is increasing at a faster rate than employment. Small differences between the rates of change in employment and the labour force will have a substantial impact on the unemployment percentage.

Equation 3.2.9 can also be used as the basis for analysing changes in unemployment over time. We have :

$$U_t = U_{DD}(t) + U_{ND}(t) ; \quad U_{t+1} = U_{DD}(t+1) + U_{ND}(t+1)$$

$$\text{i.e. } U_{t+1} - U_t = (U_{DD}(t+1) - U_{DD}(t)) + (U_{ND}(t+1) - U_{ND}(t))$$

Dividing through by E_t and assuming that $U_{DD}(t+1)/E_t$ is equal to $U_{DD}(t+1)/E_{t+1}$ and that $U_{ND}(t+1)/E_t$ is equal to $U_{ND}(t+1)/E_{t+1}$, we have :

$$u_{t+1} - u_t = (u_{dd}(t+1) - u_{dd}(t)) + (u_{ndd}(t+1) - u_{ndd}(t)) \quad (3.3.14)$$

That is, changes in unemployment over time can be dichotomised into changes in demand-deficient unemployment and changes in non demand-deficient unemployment. Provided that the unemployment-vacancy relationship is stable, changes in unemployment in the short-term will consist of changes in demand-deficient unemployment only.

3.3.5 Changes in Unfilled Vacancies

There are two components of a change in the demand for labour :

a change in the level of employment and a change in unfilled vacancies.

From equation 3.2.8 we have :

$$E_t^* = E_t + V_t ; \quad E_{t+1}^* = E_{t+1} + V_{t+1}$$

$$\text{i.e.} \quad E_{t+1}^* - E_t^* = (E_{t+1} - E_t) + (V_{t+1} - V_t) \quad (3.3.15)$$

Dividing both sides by E_t , setting $(E_{t+1}^* - E_t^*)/E_t$ equal to e_t^* and assuming that V_{t+1}/E_t is equal to v_{t+1} (V_{t+1}/E_{t+1}), we have :

$$(E_{t+1}^* - E_t^*)/E_t = (E_{t+1} - E_t)/E_t + (V_{t+1} - V_t)/E_t$$

$$\text{i.e.} \quad e_t^* = e_t + v_{t+1} - v_t$$

$$\text{i.e.} \quad v_{t+1} - v_t = e_t^* - e_t \quad (3.3.16)$$

For the unfilled vacancy percentage to be constant over time it is necessary for the rate of change in the demand for labour to equal the rate of change in employment. That is, simply :

$$e_t^* = e_t \quad (\text{for } v_{t+1} - v_t = 0) \quad (3.3.17)$$

Since unfilled vacancies are low relative to employment and the demand for labour, small differences between the percentage change of employment and the demand for labour will have a large impact on the unfilled vacancies percentage.

3.3.6 Changes in Employment

Changes in unfilled vacancies have been considered in the previous sub-section where it was noted that changes in employment, the other component of the demand for labour, can have a substantial impact on the unfilled vacancies percentage. Changes in employment are the result of changes in the demand for goods and services, in the productivity of labour or some combination of both. From equation 3.2.7 we have :

$$Y_t = Q_t \cdot E_t ; \quad Y_{t+1} = Q_{t+1} \cdot E_{t+1}$$

$$\text{i.e.} \quad Y_{t+1} - Y_t = Q_{t+1} \cdot E_{t+1} - Q_t \cdot E_t$$

From equation 3.3.1 we have :

$$Y_{t+1} - Y_t = E_t(Q_{t+1} - Q_t) + Q_t(E_{t+1} - E_t)$$

$$(Y_{t+1} - Y_t)/Y_t = E_t(Q_{t+1} - Q_t)/E_t \cdot Q_t + Q_t(E_{t+1} - E_t)/E_t \cdot Q_t$$

$$\text{i.e.} \quad y_t = q_t + e_t$$

$$\text{i.e.} \quad e_t = y_t - q_t \quad (3.3.18)$$

By definition changes in the relationship between the aggregate demand for goods and services and employment will be reflected in the productivity of labour. For example, an increase in the productivity of labour would, other things being equal, reduce the impact of an increase in the demand for goods and services on employment.

3.3.7 Equilibrium Over Time

Equilibrium in the labour market at any point in time is assumed to be at full employment as defined by equality between unemployment and unfilled vacancies (i.e. $u = v$). Assuming that there is no change in non demand-deficient unemployment, the point at which $u=v$, then equilibrium in the labour market involves achieving and maintaining variables in the labour market such that the levels of unemployment and unfilled vacancies are equal and both the unemployment percentage and the unfilled vacancies percentage are constant over time. That is, we require :

$$u_t = v_t$$

$$u_{t+1} - u_t = 0$$

$$v_{t+1} - v_t = 0$$

For the unemployment percentage, u_t , to be constant over time it is necessary for l_t to be equal to e_t . For the unfilled vacancies percentage to be constant over time we require that e_t^* be equal to e_t . The equilibrium conditions may be summarised as :

$$\begin{aligned} u_t &= v_t \\ l_t &= e_t = e_t^* \end{aligned} \quad (3.3.19)$$

3.4 Unemployment-Vacancy Relationship

The relationship between the unemployment-vacancy relation and non demand-deficient unemployment has been outlined in section 1.3. To determine the level of non demand-deficient unemployment in the economy it is necessary to obtain statistical estimates of the parameters of the u-v relationship. With respect to the empirical analysis of the u-v relationship we are interested in the following :

- (1) The form of the relationship - particularly whether the relation is linear or non-linear.
- (2) The significance of the direction and rate of change in the demand for labour.
- (3) Shifts in the u-v relationship.
- (4) The nature of shifts in the relationship.

Empirical testing of the u-v relationship will be undertaken and presented for both a linear and non-linear form of the relation.

3.4.1 Unemployment-Vacancy Relationship : Linear

The first step in the empirical testing of the u-v relationship is to estimate a regression equation between u and v (the time subscript, t , is implicit) of the form :

$$u = a + b_1.v + e' \quad (e' = \text{error term}) \quad (A.1)$$

In considering the results of the estimated equation, the sign, magnitude and significance of the coefficient b_1 is of particular importance.

The second step is to test the significance of the rate of change in either u or v in the relationship. This is to test whether the position of the u - v relationship is affected by the direction and rate of change in the demand for labour. The equation to be tested is of the form :

$$u = a + b_1 \cdot v + b_2 \cdot \dot{u}' + e' \quad (A.2)$$

or

$$u = a + b_1 \cdot v + b_2 \cdot \dot{v}' + e'$$

where \dot{u}' = rate of change in u
 \dot{v}' = rate of change in v

Assuming no change in the statement ratio, changes in non demand-deficient unemployment will be associated with shifts in the position of the u - v relationship. To test for shifts in the relation dummy variables are included in the estimating equation. To test for a shift in the intercept term only we have :

$$u = a + b_1 \cdot v + b_2 \cdot d_1 + e' \quad (A.3)$$

In the above, d_1 is a variable which takes the value of zero up to the time of the shift in the relationship and a value of 1 thereafter, The point at which the value of d_1 changes from 0 to 1 can be varied in order to determine when the shift in the relationship took place.

Testing for changes in the slope of the relationship involves estimation of the parameters of an equation of the form :

$$u = a + b_1 \cdot v + b_2 \cdot d_1 \cdot v + e' \quad (A.4)$$

It is possible to test for changes in both the intercept term and the slope of the relationship simultaneously in which case the testing equation is of the form :

$$u = a + b_1 \cdot v + b_2 \cdot d_1 + b_3 \cdot d_1 \cdot v + e' \quad (A.5)$$

It may be that the u-v relationship is shifting gradually through time rather than at a particular point in time. This possibility may be examined by including a time trend variable, t' , in the regression equation. The variable t' has a value of zero in the first period and then increases linearly through time :

$$u = a + b_1.v + b_2.d_1 + b_3.d_1.v + b_4.t' + e' \quad (A.6)$$

At this point the rate of change in unemployment or unfilled vacancies could be re-introduced as an independent variable. We have :

$$u = a + b_1.v + b_2.d_1 + b_3.d_1.v + b_4.t' + b_5.\dot{u}' + e' \quad (A.7)$$

or

$$u = a + b_1.v + b_2.d_1 + b_3.d_1.v + b_4.t' + b_5.\dot{v}' + e'$$

3.4.2 Unemployment-Vacancy Relationship : Log-Linear

As outlined in section 1.3.5, the unemployment-vacancy relationship is expected to take on a non-linear form over a sufficiently broad range of unemployment and unfilled vacancies percentages. The equation to be used in testing the non-linear form of the relationship is one which is linear in the logarithms of the variables :

$$\text{i.e. } u = a.v^b.e' \quad (e' \text{ an error term})$$

$$\log u = a' + b_1.\log v + e'' \quad (B.1)$$

(e'' - log error term)

As with equation A.1, the sign (expected to be negative), magnitude and significance of the coefficient b_1 is of primary importance. The value of this coefficient represents the elasticity of unemployment with respect to unfilled vacancies.

Rates of change in unemployment and unfilled vacancies are not included as independent variables in the empirical testing of the non-linear relationship since these variables will, in almost all foreseeable circumstances, take on negative values and thus be undefined in

logarithmic form. Type B.2 equations will not therefore be tested.

In looking at the stability of the u-v relationship we are interested in both parallel shifts (changes in a') and in changes in the elasticity of u with respect to v (changes in b_1). In testing for parallel shifts the following equation is used :

$$\log u = a' + b_1 \cdot \log v + b_2 \cdot d_1 + e'' \quad (B.3)$$

In testing for a change in the elasticity of u with respect to v the following regression equation is estimated :

$$\log u = a' + b_1 \cdot \log v + b_2 \cdot d_1 \cdot \log v + e'' \quad (B.4)$$

It is possible to test for a change in both a' and b_1 simultaneously using :

$$\log u = a' + b_1 \cdot \log v + b_2 \cdot d_1 + b_3 \cdot d_1 \cdot \log v + e'' \quad (B.5)$$

The other possibility to be tested is that of the u-v relationship shifting gradually through time. This involves the inclusion of t' in the estimating equation :

$$\log u = a' + b_1 \cdot \log v + b_2 \cdot d_1 + b_3 \cdot d_1 \cdot \log v + b_4 \cdot t' + e'' \quad (B.6)$$

3.5 Non Demand-Deficient Unemployment

The method of estimating the level of non demand-deficient unemployment has been outlined in section 1.3.5. To determine non demand-deficient unemployment it is necessary to estimate an equation of the form B.1 and the statement ratio, s .

If there have been shifts in the u-v relationship, then type B.1 equations are estimated for sub-periods over which the u-v relationship is stable. Assuming a statement ratio, s , of unity, non demand-deficient unemployment would be the solution of the two equations :

$$\begin{aligned} \log u &= a' + b_1 \cdot \log v \\ \log u &= \log v \end{aligned}$$

In the estimation of non demand-deficient unemployment it is simpler to work with linear relationships, either direct estimates of type A.1 equations or linear approximations of the type B.1 equations :

$$u = a + b_1.v$$

$$u = v$$

Estimates of non demand-deficient unemployment will be obtained for the case of s equal to unity. In most empirical cases the statement ratio is less than unity and a method of estimating s is necessary in order to determine u_{nd} .

3.5.1 The "Statement Ratio" (s)

The statement error in unfilled vacancy data derives from the fact that the coverage of unemployment is greater than that for unfilled vacancies. Coverage is defined below :

- (1) Coverage of unemployment : the proportion of all unemployed persons who register for employment with the Commonwealth Employment Service.
- (2) Coverage of unfilled vacancies : the proportion of all "true" vacancies which are notified to the C.E.S.

The coverage of vacancies by the C.E.S. will normally be less than that of unemployment. That is, there will be a "statement error" in data on unfilled vacancies when compared to unemployment. There are two main reasons for the difference in coverage :

- (1) Registration with the C.E.S. is a prerequisite for the receipt of unemployment benefit. The reporting of vacancies to the C.E.S. is voluntary and there is no direct financial incentive associated with the notification thereof.
- (2) The coverage of vacancies will depend on the degree of employer utilisation of the services of the C.E.S. This will be determined largely by the effectiveness of the C.E.S. in recruiting suitable labour for employers. There are media and means other than the C.E.S. for advertising vacancies and recruiting labour. The generally larger size of the units seeking labour, compared to those seeking jobs (individuals), means that they have greater access to these other forms of recruitment.

The statement ratio will vary with the demand for labour, although it is not possible to predict a priori how it will vary. In periods of high demand for labour it will be difficult to obtain labour through the C.E.S. and this could result in increased usage of alternative means to obtain labour which is in short supply. On the other hand, employers may exaggerate their demand in order to get the amount they need. In periods of low demand for labour it may not be necessary to utilise the services of the C.E.S. since it will be easy to obtain labour without assistance.

The coverage of vacancies (and thus s) is likely to remain fairly constant over time, apart from cyclical variations. Most organisations have established procedures for the recruitment of labour and these are subject to inertia and only slow change over time. Should significant changes in the coverage of vacancies over time occur, results based on a constant s will be biased.

3.5.2 Estimation of s : Normal Method

The usual method of estimating the statement ratio, s ,¹ embodies the following steps. Firstly, set limits for s based on the observed u and v in periods identified as characterised by positive and negative excess demand for labour. Secondly, identify periods of zero excess demand ($u = v/s$) on the basis of external data (e.g. data on employment, hours of work). The ratio v/s at these points of zero excess demand will give estimates of s . The average of these estimates gives the estimate of s for the period.

This method has been used with satisfactory results, although there are deficiencies associated with the method. Firstly, it is

1. e.g. A.J.Hagger, "The Excess Demand for Labour in Australia, 1948-63" (Economic Record, March, 1970), pp. 26-54.

necessary to arbitrarily identify periods of zero excess demand for labour and to use external data in this identification. Secondly, there may be only a few identifiable periods of zero excess demand for labour and the estimate of s may, thus, be based on only a small sample of observations. Thirdly, it may not be reasonable to use external data to identify periods of zero excess demand for labour. There are significant inter-sectoral differences in the pressure of demand for labour and these sectors may experience zero excess demand for labour at different points in time. The sectors have weights in the employment and hours of work series which differ from those in the unemployment series. For example, adult males represent a much larger proportion of employment than they do of unemployment. Zero excess demand for adult males, as suggested by data on employment, does not necessarily mean zero excess demand for other sectors and the labour force as a whole, in terms of unemployment experience.

3.5.3 Towards an Alternative Method of Estimating s

There are some conceptual and definitional differences between unemployment and unfilled vacancies and these differences cast doubt on the reliability of comparing data series on u and v . Conceptual comparability has been covered in section 1.3.2 and definitional comparability will be considered in the next chapter. The inverse parallelism between u and v suggests that comparing the two data series is reasonable. Data will be presented in chapter 5 to show that inverse parallelism is evident in Australian data.

The inverse parallelism indicates that both u and v reflect the influence of a common factor : the demand for labour. The series are both sensitive, although in opposite directions, to changes in the demand for labour. Given that the behaviour of the u and v series is

comparable it would seem reasonable to assume that changes in u and v , as the demand for labour changes, are also comparable, possibly even more so than the series themselves.

Assuming that changes in the demand for labour are the only significant factor causing changes in u and v it is possible to move towards an alternative method of estimating s by imposing a certain condition :

.....that the u and v series be equally sensitive to changes in the demand for labour if the coverage of unfilled vacancies is equal to that for unemployment.....

Consider the behaviour of the u and v series over a specified period of time. To be equally sensitive to changes in the demand for labour we would expect that the amplitude of the v series would be similar to that for the u series. If the amplitude of the unfilled vacancies series is substantially less than that of the unemployment series we would assume that there is a significant understatement of unfilled vacancies relative to unemployment (i.e. a statement ratio, s , with a value of less than one). An estimate of s can be obtained as the ratio of the amplitude of the v series to that of the u series.

There are two problems associated with this method that must be considered. Firstly, both u and v are subject to a lower limit of zero. It is to be expected that the u and v series will be equally sensitive to small changes in the demand for labour. Beyond a certain point, as the demand for labour decreases, u will become increasingly, and v decreasingly, sensitive to further changes in the demand for labour. It is necessary to exclude such periods of very high or very low demand for labour from the set of observations used to estimate s . Secondly, there is a component in both u and v which is insensitive to the demand for labour. In the unemployment series this component is termed "hard-core unemployed" or "unemployables" and relates to those

persons who are difficult to employ, irrespective of the availability of jobs, because of various personal characteristics (e.g. habitual drunkenness, poor attitudes to work). In the unfilled vacancies series this component is termed "hard-to-fill" vacancies and refers to jobs which, because of some unfavourable characteristic such as isolated location, are the object of unsatisfied search even though suitable labour is available.

The significance of this component may differ as between u and v. If we assume that the minima of the series reflect this component which is insensitive to the demand for labour, it is possible to adjust the estimate of s by imposing a second condition :

.....that the average minimum value of u be equal to the average minimum value of v.....

3.5.4 Proposed Method of Estimating s

The statement ratio, s , is defined as the ratio of registered to "true" vacancies :

$$\text{i.e. } s = v / v' \quad (\text{where } v' \text{ is the true level of } v)$$

The first specified condition is that the u and v series be equally sensitive to the demand for labour. The sensitivity of the u and v series can be measured by the amplitude of the respective series. A suitable measure of amplitude is the average deviation of the series from its mean. Assuming we have n observations on the variables u and v, the condition of equal sensitivity may be expressed as :

$$\sum_{t=1}^n \left| \frac{v_t - \bar{v}}{n} \right| = \sum_{t=1}^n \left| \frac{u_t - \bar{u}}{n} \right|$$

$$\text{i.e. } \sum_{t=1}^n |v_t - \bar{v}| = \sum_{t=1}^n |u_t - \bar{u}|$$

$$\bar{v} = \sum_{t=1}^n v_t / n$$

$$\bar{u} = \sum_{t=1}^n u_t / n$$

Let s' stand for that part of the estimate of s relating to the first condition. We have :

$$s' = \frac{\sum_{t=1}^n |v_t - \bar{v}|}{\sum_{t=1}^n |u_t - \bar{u}|}$$

The second condition is that the average minimum value for u be equal to the average minimum value for v . That is :

$$\bar{u}_{\min} = \bar{v}_{\min}$$

Let s'' represent that part of the estimate of s relating to this second condition. We have :

$$s'' = \bar{v}_{\min} / \bar{u}_{\min}$$

For v equal to \bar{v}_{\min} , the true level of v , v' , will be equal to v divided by s'' . The general equation for v' is given by :

$$v' = \bar{v}_{\min} / s'' + (v - \bar{v}_{\min}) / s'$$

The estimate of s is equal to v divided by v' . That is :

$$s = v / \left[\bar{v}_{\min} / s'' + (v - \bar{v}_{\min}) / s' \right]$$

When empirical estimates are substituted in the above equation it will simplify to an equation of the form :

$$v' = a' + b'.v \quad b' > 0$$

Non demand-deficient unemployment is given by the level of unemployment at the point at which u is equal to v . That is, the value of u_{nd} is determined by the intersection of the above line with the $u-v$ relationship. To estimate u_{nd} , thus, the following two equations are solved for u :

$$u = a + b.v \quad b < 0$$

$$u = a' + b'.v \quad b' > 0$$

3.6 Flows in the Labour Market

The relationship between turnover in the labour force and the position of the unemployment-vacancy relationship has been briefly outlined in section 1.4 . A more detailed description of the flows in the labour market affecting the levels of unemployment and unfilled vacancies is presented in this section.

3.6.1 Outline of Flows

An outline of labour market flows is presented in figure 3.2 . The diagram outlines the flows of both workers and jobs. Workers flow between employment, unemployment, not in the labour force and not in the population. The flow of vacancies is generated by both economic growth and labour turnover.

Labour market variables such as unemployment, vacancies and employment are usually measured as stocks. One means of analysing labour market behaviour is to compare these stocks at various points in time. Changes in these stocks between any two points in time are regulated by flows between the stocks in the intervening period. Thus, an alternative or supplementary method of analysing labour market behaviour is to examine the behaviour of flows in the labour market in relation to the stocks and changes therein.

The flows of persons in the labour force consist of flows between :

- (1) Employment and unemployment - voluntary and involuntary job leavers who incur a period of unemployment before being re-employed.
- (2) Employment and employment - job changing that does not result in a period of time during which the persons involved are unemployed.
- (3) Employment and not in the labour force - withdrawals from employment for the purpose of leaving the labour force.

- (4) Unemployment and not in the labour force - the cessation of persons currently unemployed from searching for jobs.
- (5) Not in the population and employment, not in the labour force and unemployment - the net flow of persons not previously in the population into various labour force states.

The analysis of flows in the labour market is concerned with the behaviour of the flows over time, particularly the manner in which the flows react to changes in the demand for labour. Since flows in the labour market relate to the total labour force while unemployment and unfilled vacancies typically comprise only a small percentage thereof, small changes in the absolute and relative magnitudes of the flows in the labour market can materially affect the stocks of unemployed persons and unfilled vacancies.

There are four means by which employment is terminated :

- (1) Quits : separations from employment initiated voluntarily by the employee.
- (2) Layoffs : reductions in the size of the work force initiated by the employer.
- (3) Dismissals : the involuntary termination of employment as a result of unsatisfactory performance by an employee.
- (4) Retirements : terminations from employment as a result of legal or institutional regulations or personal decisions not to work any longer.

The flow of quits, dismissals and retirements will generate a flow of vacancies which will supplement new vacancies arising from economic growth in providing employment opportunities for those seeking work. Some vacancies generated by labour turnover and some new vacancies, generated by growth, will be filled immediately and will not give rise to unfilled vacancies. The flow of quits, layoffs and dismissals will generate a flow of unemployed persons supplemented by flows from outside the labour force. Some will find employment immediately, or within a very short time, and will not incur unemployment.

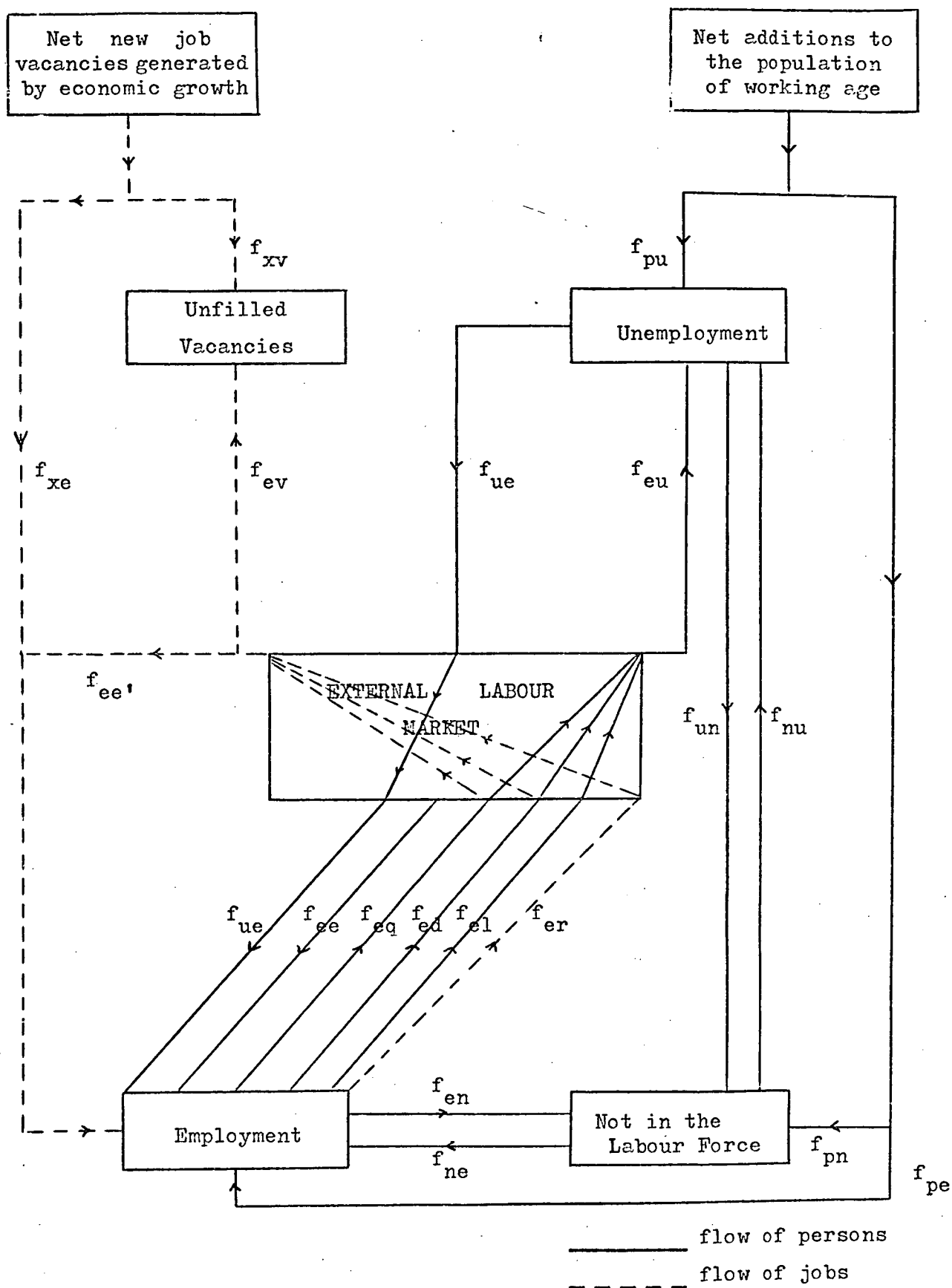


figure 3.2

Outline of Flows in the Labour Market

3.6.2 Definition of Variables

The absolute flow in period t will be notated by $F_{ij}(t)$ where i represents the stock from which the flow originates and j represents either the stock to which the flow is directed or the cause of the flow. The subscripts used to denote the various stocks or causes of flows are :

e : employment
 u : unemployment
 n : not in the labour force
 p : not in the population
 v : unfilled vacancies
 q : quits
 l : layoffs
 d : dismissals
 r : retirements

The analysis involves comparisons over time and to deflate the flows the series on employment, E_t , will be used. The deflated flow will be represented by $f_{ij}(t)$ where $f_{ij}(t)$ is equal to $F_{ij}(t)/E_t$.

The flows of persons in the labour market are outlined below :

- $F_{pu}(t)$: the number of persons who enter the population and incur unemployment during period t (e.g. immigrants).
 $F_{nu}(t)$: the number of persons who were in the population, but not in the labour force at the beginning of period t , and who entered the labour force during period t (e.g. married women, school leavers).
 $F_{eu}(t)$: the number of persons who lost or left their employment during period t and incurred unemployment (e.g. persons laid off).
 $F_{ee}(t)$: the number of persons who lost or left their jobs and were re-employed during period t without incurring unemployment (e.g. persons who quit their employment for the purpose of accepting an alternative job offer).
 $F_{pe}(t)$: the number of persons who enter the population and find employment in period t without incurring unemployment (e.g. a person who migrates to Australia to take up an appointment).
 $F_{ue}(t)$: the number of persons who are unemployed and find employment in period t (the absorption of the unemployed into jobs).

- $F_{ne}(t)$: the number of persons who were not in the labour force and moved into employment during period t without being unemployed (e.g. the movement of a school leaver into a prearranged job).
- $F_{pn}(t)$: the number of persons who enter the population but not the labour force during period t (e.g. non-working wives of migrants).
- $F_{un}(t)$: the number of persons who withdraw from the labour force during period t after experiencing a period of unemployment (e.g. the withdrawal of discouraged workers during a period of low demand for labour).
- $F_{en}(t)$: the number of persons who were employed and left the labour force during period t (e.g. retirement of workers (= $F_{er}(t)$) at the prescribed age).
- $F_{eq}(t)$: the number of persons who quit their jobs in period t .
- $F_{el}(t)$: the number of persons who were laid off from their employment during period t .
- $F_{ed}(t)$: the number of persons who were dismissed from their employment during period t .

These flows relate to the flow of persons through the labour market and will affect the flow of jobs and vacancies. The outline of flows is not completely exhaustive (e.g. deaths of unemployed persons, $F_{up}(t)$, is not included) .

3.6.3 Changes in Aggregates : Flows of Persons

(1) Unemployment : flows into - $F_{nu}(t)$; $F_{pu}(t)$; $F_{eu}(t)$

flows out of - $F_{un}(t)$; $F_{ue}(t)$

$$U_{t+1} - U_t = (F_{nu}(t) - F_{un}(t)) + (F_{eu}(t) - F_{ue}(t)) + F_{pu}(t)$$

$$u_{t+1} - u_t = (f_{nu}(t) - f_{un}(t)) + (f_{eu}(t) - f_{ue}(t)) + f_{pu}(t)$$

(approximately)

(2) Labour Force : flows into - $F_{pe}(t)$; $F_{pu}(t)$; $F_{nu}(t)$; $F_{ne}(t)$

flows out of - $F_{un}(t)$; $F_{en}(t)$

$$L_{t+1} - L_t = (F_{nu(t)} - F_{un(t)}) + (F_{ne(t)} - F_{en(t)}) + F_{pe(t)} + F_{ne(t)}$$

$$l_t = (f_{nu(t)} - f_{un(t)}) + (f_{ne(t)} - f_{en(t)}) + f_{pe(t)} + f_{ne(t)}$$

(3) Employment : flows into - $F_{ee(t)}$; $F_{ue(t)}$; $F_{pe(t)}$; $F_{ne(t)}$

flows out of - $F_{ee(t)}$; $F_{eu(t)}$; $F_{en(t)}$

$$E_{t+1} - E_t = (F_{ue(t)} - F_{eu(t)}) + (F_{ne(t)} - F_{en(t)}) + F_{pe(t)}$$

$$e_t = (f_{ue(t)} - f_{eu(t)}) + (f_{ne(t)} - f_{en(t)}) + f_{pe(t)}$$

Now, the flows out of employment outlined above are equal, in total, to the outflows from employment by cause :

$$\text{i.e. } (F_{ee(t)} + F_{eu(t)} + F_{en(t)}) = (F_{eq(t)} + F_{el(t)} + F_{ed(t)} + F_{en(t)})$$

The right-hand side of the above expression is the total number of "separations" in period t (S_t) and expressed as a percentage of employment is the "separation rate" (s_t). That is :

$$S_t = F_{eq(t)} + F_{el(t)} + F_{ed(t)} + F_{en(t)}$$

$$s_t = f_{eq(t)} + f_{el(t)} + f_{ed(t)} + f_{en(t)}$$

Similarly, the sum of the flows into employment is equal to the total number of "engagements" in period t (Z_t). Expressed as a percentage of employment it is the "engagement rate" (z_t). That is :

$$Z_t = F_{ee(t)} + F_{ne(t)} + F_{ue(t)} + F_{pe(t)}$$

$$z_t = f_{ee(t)} + f_{ne(t)} + f_{ue(t)} + f_{pe(t)}$$

3.6.4 Changes in Aggregates : Flows of Jobs

Job vacancies can be thought of as comprising two main components : those that result from labour turnover and those that are the result of economic growth (new vacancies).

- (1) Economic Growth - vacancies caused by economic growth reflect changes in the total demand for labour ($E + V$). Let the number of net new job vacancies created by economic growth be represented by F_{xv} . Some jobs created by increases in demand will be filled immediately and will not result in unfilled vacancies : this flow is denoted by F_{xe} . The total flow of new jobs in period t is equal to the sum of F_{xv} and F_{xe} .
- (2) Labour Turnover - there are three flows of persons in the labour force that give rise to job vacancies :

F_{eq} : quits by employed persons
 F_{ed} : dismissals of employed persons
 F_{er} : retirements of employed persons

The number of vacancies generated by labour turnover is given by F_{ev} . Some vacancies resulting from labour turnover are filled immediately or almost so and do not result in vacancies remaining unfilled at any time. Let this flow be represented by $F_{ee'}$. The total flow into unfilled vacancies is given by :

$$F_{xv} + F_{ev} = F_{xv} + (F_{eq} + F_{ed} + F_{er} + F_{ee'}) \quad (\text{subscript } t \text{ implicit})$$

Unfilled vacancies may be filled from four possible sources : unemployed persons, those not previously in the labour force, new additions to the population and the re-employment of those who terminate their employment or have it terminated. The level of the stock of unfilled vacancies will depend on the vacancy flow generated by economic growth and labour turnover and the efficiency with which the jobs in the vacancy flow are filled by persons from the above sources.

3.6.5 Incidence and Duration of Unemployment

The stock of unemployed persons at any point in time may be viewed as the product of the flow of unemployed persons during t and the average duration of unemployment in period t . That is :

$$u_t = (f_{eu(t)} + f_{pu(t)} + f_{nu(t)}) \cdot D_{u(t)}$$

where $D_{u(t)}$ is the average duration of unemployment in period t .

$$\text{i.e. } u_t = I_{u(t)} \cdot D_{u(t)} \quad \text{where } I_{u(t)} = f_{eu(t)} + f_{pu(t)} + f_{nu(t)} \\ \text{is the incidence of unemployment.}$$

The above relationship is a very useful one and an analysis of unemployment and changes therein on the basis of this relationship would shed light on the nature of unemployment and the factors involved in determining the position of the unemployment-vacancy relationship. It is possible to look more closely at the determinants of the incidence of unemployment :

f_{eu} : this flow is related to the separation rate, s , (excluding retirements) and the efficiency of job finding for those who leave or lose their jobs.

f_{pu} : this flow will depend on the rate of population growth, the demographic composition of the population and the efficiency with which additions to the population find employment (i.e. the value of f_{pe} relative to f_{pu}).

f_{nu} : this flow will depend on the participation behaviour of the population and the value of f_{ne} relative to f_{nu} .

A variation in one of these flows, *cet par*, will change the incidence of unemployment and the position of the unemployment-vacancy relationship. A variation in the value of the flow for all levels of demand for labour will change the constant term in the $u-v$ relationship; changes in the sensitivity of the flow to the demand for labour will change the elasticity of u with respect to v .

Changes in the unemployment percentage, u , will reflect changes in the incidence of unemployment, in the duration of unemployment or in some combination of both. From equation 3.3.2 we have :

$$\dot{u}_t = i_{u(t)} + d_{u(t)} \quad (\text{approximately})$$

$$\text{where } i_{u(t)} = (I_{u(t+1)} - I_{u(t)}) / I_{u(t)}$$

$$d_{u(t)} = (D_{u(t+1)} - D_{u(t)}) / D_{u(t)}$$

Changes in the duration of unemployment will affect the position of the unemployment-vacancy relationship. The duration of unemployment is determined by factors such as the cost of remaining unemployed, the

availability of information on job vacancies, the "placement lag", the current availability of unfilled vacancies, the rate of flow of new vacancies and the degree of matching between the unemployed and unfilled vacancies.

Consider the relationship between the incidence of unemployment and turnover in the labour force. Let us define labour turnover, T , as :

$$T = (f_{eq} + f_{el} + f_{ed}) + (f_{pu} + f_{pe}) + (f_{nu} + f_{ne})$$

Now, let the proportion of persons in the turnover flow who incur unemployment be denoted by P_u . We have :

$$u = D_u \cdot T \cdot P_u \quad (\text{where } I_u = T \cdot P_u)$$

This expression serves to elucidate the relationship between labour turnover and unemployment. As the demand for labour increases the unemployment percentage falls because, although labour turnover may increase (e.g. the quit rate may increase), this increase would be more than offset by reductions in either the duration of unemployment (the period of job search) or the proportion of persons in the turnover flow who incur unemployment or both factors. Now,

$$P_u = I_u / T$$

$$\text{i.e. } P_u = (f_{eu} + f_{pu} + f_{nu}) / (f_{eq} + f_{el} + f_{ed} + f_{pu} + f_{pe} + f_{nu} + f_{ne})$$

The value of P_u will depend, firstly, on the value of f_{eu} relative to $(f_{eq} + f_{el} + f_{ed})$ - the degree of difficulty job losers and job leavers experience in finding employment - and, secondly, on the value of $(f_{pu} + f_{nu})$ relative to $(f_{pe} + f_{ne})$ - the degree of difficulty new entrants and re-entrants to the labour force experience in finding employment.

3.6.6 Incidence and Duration of Unemployment : Testing

It is postulated that the incidence of unemployment will be dependent on the unemployment percentage and the direction and rate of change thereof. Changes in the incidence of unemployment will, ceteris paribus, change the position of the unemployment-vacancy relationship and, thus, the level of non demand-deficient unemployment. Dummy variables, both shift and slope, and a time trend variable, t' , are introduced as independent variables to test for changes in the behaviour of the incidence of unemployment. The testing equation is :

$$I_u = a + b_1 \cdot u + b_2 \cdot \dot{u} + b_3 \cdot d_1 + b_4 \cdot d_1 \cdot u + b_5 \cdot t' + e' \quad (C.1)$$

There is one problem associated with testing the above relationship, relating to the fact that the dependent variable, I_u , does by definition partly determine the value of the independent variable, u . Since we are primarily interested with changes in the behaviour of I_u relative to u , equation C.1 will be useful. The testing of C.1 type equations will be supplemented by the fitting of a relationship between the incidence of unemployment and an independent labour market variable, unfilled vacancies :

$$I_v = a + b_1 \cdot v + b_2 \cdot \dot{v} + b_3 \cdot d_1 + b_4 \cdot d_1 \cdot v + b_5 \cdot t' + e' \quad (C.2)$$

In analysing the behaviour of the duration of unemployment and testing for changes therein, similar equations will be used as those for the incidence of unemployment :

$$D_u = a + b_1 \cdot u + b_2 \cdot \dot{u} + b_3 \cdot d_1 + b_4 \cdot d_1 \cdot u + b_5 \cdot t' + e' \quad (C.3)$$

$$D_v = a + b_1 \cdot v + b_2 \cdot \dot{v} + b_3 \cdot d_1 + b_4 \cdot d_1 \cdot v + b_5 \cdot t' + e' \quad (C.4)$$

It would be preferable to test the determinants of I_u (i.e. T and P_u) separately, but data limitations prevent such testing.

3.6.7 Incidence and Duration of Unfilled Vacancies

A similar analysis as that for unemployment can be undertaken for unfilled vacancies. The stock of unfilled vacancies may be viewed as the product of the flow of vacancies and the average duration thereof :

$$v = (f_{xv} + f_{ev}) \cdot D_v \quad \text{where } D_v \text{ is the average duration of unfilled vacancies.}$$

$$\text{i.e. } v = I_v \cdot D_v \quad \text{where } I_v = f_{xv} + f_{ev} \text{ is the incidence of unfilled vacancies}$$

The incidence of unfilled vacancies will depend on :

f_{xv} : this flow is related to the creation of new jobs as a result of economic growth and the efficiency with which these new jobs are filled (i.e. the value of f_{xe} relative to f_{xv}).

f_{ev} : this flow will depend on labour turnover (part thereof - $f_{eq} + f_{ed} + f_{er}$) and the ease with which vacated jobs are refilled (i.e. the value of f_{ee} relative to f_{ev}).

Denote the total flow of jobs by J where :

$$J = f_{xv} + f_{xe} + (f_{eq} + f_{ed} + f_{er})$$

Let the proportion of jobs in the total job flow that result in unfilled vacancies be P_v . We have :

$$v = D_v \cdot J \cdot P_v \quad \text{where } J \cdot P_v = I_v$$

$$P_v = (f_{xv} + f_{ev}) / (f_{xv} + f_{xe} + f_{eq} + f_{ed} + f_{er})$$

Changes in the duration and incidence of unfilled vacancies will affect the position of the unemployment-vacancy relationship. For example, the efficiency of the employment service may improve and result in a faster matching of unemployed persons with unfilled vacancies. This will reduce the duration of unfilled vacancies, and of unemployment, and the u-v relationship will shift towards the origin.

Alternatively, the quit rate in periods of high demand for labour may be higher than previously. This will increase the incidence of unfilled vacancies and, thus, the level of unfilled vacancies relative to unemployment. The elasticity of unemployment with respect to unfilled vacancies will decrease.

3.6.8 Incidence and Duration of Unfilled Vacancies : Testing

The equations to be used for testing the behaviour of the incidence and duration of unfilled vacancies are similar to those for the incidence and duration of unemployment :

$$I_v = a + b_1.v + b_2.\dot{v} + b_3.d_1 + b_4.d_1.v + b_5.t' + e' \quad (D.1)$$

$$I_v = a + b_1.u + b_2.\dot{u} + b_3.d_1 + b_4.d_1.u + b_5.t' + e' \quad (D.2)$$

$$D_v = a + b_1.v + b_2.\dot{v} + b_3.d_1 + b_4.d_1.v + b_5.t' + e' \quad (D.3)$$

$$D_v = a + b_1.u + b_2.\dot{u} + b_3.d_1 + b_4.d_1.u + b_5.t' + e' \quad (D.4)$$

3.7 Supply and Demand Factors

The slope and intercept of the unemployment-vacancy relationship is dependent, in part, on supply and demand factors. Changes in these factors can affect the level of non demand-deficient unemployment. Consider the relationship between the aggregate demand for goods and services and the level of unemployment and assume that there is an increase in aggregate demand. The increase in output could be realised through a combination of the following :

- (1) the employment of previously unemployed persons
- (2) the employment of persons previously not in the labour force.
- (3) an increase in the productivity of labour employed

Stability in the u-v relationship implicitly assumes that the relationship between changes in aggregate demand and the above factors is unchanged. Changes in demand are associated with movement along

the u-v relationship. Assume that as the demand for goods and services increases there is a tendency for employers to rely more than previously on longer working hours in preference to an increase in employment to satisfy the increased demand. This behaviour would be reflected by an increase in the productivity of labour employed. The effect of the increased demand on unemployment would be less than previously and the u-v relationship would shift to a position further from the origin. Non demand-deficient unemployment would increase.

The following equation will be used to test for a shift in the relationship between changes in demand and changes in unemployment :

$$\dot{u} = a + b_1.y + b_2.d_1 + e' \quad (E.1)$$

The position of the u-v relation is dependent on the relationship between changes in demand and unfilled vacancies as well as between changes in demand and unemployment. The aforementioned tendency towards greater utilisation of existing employees rather than increased employment to satisfy an increase in demand, for example, would result in a lower level of unfilled vacancies than previously. The equation to be used for testing for a shift in the relationship between demand and unfilled vacancies is :

$$\dot{v} = a + b_1.y + b_2.d_1 + e' \quad (E.2)$$

3.7.1 Supply Factors : Testing Equations

The relationship between the supply of labour and unemployment has been outlined in section 3.3.4. Stability in the u-v relation implies that there is, other things being equal, a particular rate of change in the labour force associated with any given level of unemployment. This rate of change in the labour force may depend on the

direction and rate of change in the unemployment percentage, \dot{u} , as well as the unemployment percentage, u , itself. The following equation will be used to test for changes in the supply of labour :

$$l = a + b_1 \cdot u + b_2 \cdot \dot{u} + b_3 \cdot d_1 + e' \quad (E.3)$$

Changes in the supply of labour may be the result of the response to the level and rate of change of unfilled vacancies. We can test for a shift in the rate of change of the labour force relative to unfilled vacancies using :

$$l = a + b_1 \cdot v + b_2 \cdot \dot{v} + b_3 \cdot d_1 + e' \quad (E.4)$$

There are two sources of changes in the supply of labour : changes in the population of working age and changes in disguised unemployment (i.e. the participation behaviour of the population of working age).

Changes in the population of working age can influence the position of the $u-v$ relationship. For example, there may be a concentration of persons in a particular age category in the population as the result of abnormal circumstances (e.g. the post-war "baby boom"). Should such a group enter the working age at a particular point in time the rate of increase in the labour force may be greater than normal. The trend to an higher rate of increase in the population will tend to increase the unemployment percentage above that which it would have been had the change not occurred. There will be an outward shift and an increase in the absolute slope of the $u-v$ relationship. The possibility of such changes will be tested using :

$$p = a + b_1 \cdot u + b_2 \cdot \dot{u} + b_3 \cdot d_1 + e' \quad (E.5)$$

$$p = a + b_1 \cdot v + b_2 \cdot \dot{v} + b_3 \cdot d_1 + e' \quad (E.6)$$

Changes in participation behaviour can also affect the position of the u-v relationship. Such changes are associated with changes in the level of disguised unemployment, d , for a given level of demand. For example, a government policy change such as combining husband and wife salaries for the purpose of income taxation may result in the departure of working wives from the labour force. This would result in an increase in the level of unfilled vacancies and a decrease in unemployment as the unemployed are absorbed into the vacant positions. These changes occur at a constant level of demand and will tend to reduce the absolute slope of the u-v relationship. Disguised unemployment will decrease : the number of persons not working but willing to work if jobs were readily available will fall. Changes in participation behaviour will be tested with the following equations :

$$a = a' + b_1 \cdot u + b_2 \cdot \dot{u} + b_3 \cdot d_1 + e' \quad (E.7)$$

$$a = a' + b_1 \cdot v + b_2 \cdot \dot{v} + b_3 \cdot d_1 + e' \quad (E.8)$$

Changes in the supply of labour may be offset by changes in the behaviour of employment. From equation 3.3.13 we see that a change in l will affect the level of unemployment if it is not offset by a similar change in e . Changes in employment reflect changes in demand factors.

3.7.2 Demand Factors : Testing Equations

A stable u-v relationship implicitly assumes that, other things being equal, there is a particular rate of change in the demand for labour associated with any given level of unfilled vacancies or unemployment. As for the supply of labour, the rate of change in the demand for labour may differ according to the direction and rate of change in unfilled vacancies or unemployment. The following equations will be used to test for changes in the demand for labour :

$$e^* = a + b_1.u + b_2.\dot{u} + b_3.d_1 + e' \quad (E.9)$$

$$e^* = a + b_1.v + b_2.\dot{v} + b_3.d_1 + e' \quad (E.10)$$

In the same way that changes in l may be offset by changes in e , we see from equation 3.3.16 that changes in e^* may be similarly offset by changes in e . We can test for changes in e using :

$$e = a + b_1.u + b_2.\dot{u} + b_3.d_1 + e' \quad (E.11)$$

$$e = a + b_1.v + b_2.\dot{v} + b_3.d_1 + e' \quad (E.12)$$

The response of employment to changes in demand will affect the position of the $u-v$ relationship and, thus, non demand-deficient unemployment. We see from equation 3.3.18 that this response is dependent on the behaviour of the productivity of labour employed, q . For example, policies may be introduced to discourage overtime in order to increase the impact of a given increase in demand on employment. This will be reflected by a decrease in q , as a result of less hours worked per person employed, and an increase in e . The equations to be used for testing the behaviour of labour productivity are :

$$q = a + b_1.u + b_2.\dot{u} + b_3.d_1 + e' \quad (E.13)$$

$$q = a + b_1.v + b_2.\dot{v} + b_3.d_1 + e' \quad (E.14)$$

The above mentioned change would result in a reduction in unemployment as the unemployed are absorbed by the increase in employment and an increase in unfilled vacancies resulting from the search for new employees. These changes will tend to decrease the absolute slope of the $u-v$ relationship.

3.8 Sectoral Unemployment-Vacancy Relationships

As outlined in section 1.5, the nature of non demand-deficient unemployment and changes therein can be elucidated by looking at sectors

of the labour force. There are three sources of change in the position of the aggregate unemployment-vacancy relationship¹: a redistribution of demand between sectors, a change in the relative importance of sectors in the labour force and changes in sectoral unemployment-vacancy relationships. The first two factors relate to changes in the structure of unemployment and will be considered in the next section, 3.9. The third factor is the concern of this section.

A change in the position of an individual sectoral unemployment-vacancy relationship will, other things being equal, change the position of the aggregate unemployment-vacancy relationship and the level of non demand-deficient unemployment. A given change in the aggregate relationship may be the result of uniform changes in all sectoral relationships or the disproportionate shifting of a few sectoral relationships.

The method to be used is to estimate unemployment-vacancy relationships for sectors of the labour force and test these relationships for stability in a similar manner to that for the aggregate unemployment-vacancy relationship. One difficulty that arises with Australian data on unemployment and unfilled vacancies for sectors is that parallel data on employment for the sectors are not available. This means that the estimation of the unemployment-vacancy relationships is in terms of absolute levels of unemployment and unfilled vacancies rather than unemployment and unfilled vacancies percentages. This makes it difficult to assess the relative magnitudes of shifts in the sectoral unemployment-vacancy relationships. To enable direct comparison between the aggregate and sectoral relationships, the aggregate relationship will be re-estimated in terms of absolute levels of unemployment and unfilled vacancies :

1. c.f. section 1.5

$$U = a + b_1.V + b_2.\dot{U} + b_3.d_1 + b_4.d_1.V + b_5.t' + e' \quad (F.1)$$

$$\log U = a' + b_1.\log V + b_2.d_1 + b_3.d_1.\log V + b_4.t' + e'' \quad (F.2)$$

Let the number of unemployed persons in sector i be denoted by U_i and the number of unfilled vacancies in sector i by V_i . The first step is to estimate a relationship between these two variables. A time trend variable, t' , is included to allow for the growth of the population over time :

$$U_i = a + b_1.V_i + b_2.t' + e' \quad (F.3)$$

$$\log U_i = a' + b_1.\log V_i + b_2.t' + e'' \quad (F.4)$$

The estimated sectoral unemployment-vacancy relationship can be tested for stability by the inclusion of a shift dummy variable :

$$U_i = a + b_1.V_i + b_2.d_1 + b_3.t' + e' \quad (F.5)$$

$$\log U_i = a' + b_1.\log V_i + b_2.d_1 + b_3.t' + e'' \quad (F.6)$$

The nature of shifts in the relationship can be investigated further by the addition of a slope dummy variable :

$$U_i = a + b_1.V_i + b_2.d_1 + b_3.d_1.V_i + b_4.t' + e' \quad (F.7)$$

$$\log U_i = a + b_1.\log V_i + b_2.d_1 + b_3.d_1.\log V_i + b_4.t' + e'' \quad (F.8)$$

The dependence of the position of the relationship on the direction and rate of change of demand can be considered by including the rate of change of unemployment variable :

$$U_i = a + b_1.V_i + b_2.d_1 + b_3.d_1.V_i + b_4.\dot{U}_i + b_5.t' + e' \quad (F.9)$$

The testing of sectoral unemployment-vacancy relationships will be supplemented by an analysis of the structure of both unemployment and unfilled vacancies.

3.9 Structure of Unemployment and Unfilled Vacancies

The nature and causes of non demand-deficient unemployment and changes therein can be analysed through observations on the structure of unemployment and unfilled vacancies.

3.9.1 Definition

The labour force may be classified in various ways on the basis of characteristics of members of the labour force (e.g. age-sex, geographical location, occupation, industry). These characteristics provide alternative means of dividing the labour force into sectors. For example, the labour force could be divided into sectors on the basis of age-sex characteristics (e.g. males aged fifteen to nineteen years). Alternatively, the occupation of the worker may define the sectors of the labour force.

The unemployment percentage for a sector of the labour force, u_i , is defined for the purposes of this section as :

$$u_i = U_i / L_i \quad \text{where } U_i = \begin{array}{l} \text{number of unemployed persons} \\ \text{in sector } i \end{array}$$

$$\text{and } L_i = \begin{array}{l} \text{number of persons in the} \\ \text{labour force in sector } i \end{array}$$

Suppose that there are n alternative means of classifying the labour force into sectors. Assume also that the k_{th} basis of classification results in a division of the labour force into m_k sectors. For each means of dividing the labour force into sectors we obtain a vector of u_i containing m_k elements. The structure of unemployment is the set of n vectors of these u_i :

$$\text{i.e. } \left\{ u_{ki} \right\} \quad \begin{array}{l} k = 1, 2, 3 \dots n \\ i = 1, 2, 3 \dots m_k \end{array}$$

For example, if age-sex characteristics and occupation were used, alternatively, to divide the labour force into sectors, then the structure of unemployment would be the set of two vectors, one of unemployment percentages (u_i) for the age-sex sectors and one of unemployment percentages for the occupational sectors.

3.9.2 Analysis

Unemployment is not evenly distributed over the labour force and unemployment percentages will differ as between sectors. There is not just one unemployment percentage in the labour market, but a set of unemployment percentages for sectors within the labour force. These unemployment percentages are affected by the supply and demand conditions for specific types of labour and will respond in different ways to changes in the demand for labour. The level of both demand-deficient unemployment and non demand-deficient unemployment will differ between sectors. Analysis of the structure of unemployment is concerned with the distribution of unemployment between sectors (i.e. the set of sectoral unemployment percentages) and changes in this distribution over time (the behaviour of the sectoral unemployment percentages). The method to be used is that of identifying periods of similar aggregate demand for labour and observing the structure of unemployment at these times and changes therein. Such analysis will clarify the factors responsible for changes in non demand-deficient unemployment and the position of the aggregate unemployment-vacancy relationship.

Consider the analysis of an individual vector in $\{u_{ki}\}$. Assume that the labour force has been divided into m sectors. The proportion of the labour force in sector i can be taken as a measure of the relative importance of sector i in the labour force :

$$\text{i.e. } l_i = L_i / L \quad (i = 1, 2, 3, \dots, m)$$

If, for example, i represents the clerical occupation, then l_i is the proportion of the total labour force in clerical occupations. The set of sectoral unemployment percentages, $\{u_i\}$, can be multiplied by the set of labour force proportions, $\{l_i\}$, to obtain the aggregate unemployment percentage, u . That is :

$$u = \sum_{i=1}^m u_i \cdot l_i$$

The contribution of sector i to the aggregate unemployment percentage will be affected by two factors : the sectoral unemployment percentage, u_i , and the share of sector i in the labour force, l_i .

The above equation provides one possible basis for the analysis of the structure of unemployment. The difficulty associated with the use thereof is that u_i will be affected by u . It would be more useful, with respect to looking at the determinants of non demand-deficient unemployment, to analyse the structure of unemployment in terms of u_i relative to u . This involves consideration of the contribution of each sector to total unemployment. The share of sector i in total unemployment, j_i , may be expressed as :

$$\begin{aligned} j_i &= U_i / U \\ &= u_i \cdot L_i / u \cdot L \quad (\text{since } u_i = U_i / L_i \\ &\quad \text{and } u = U / L) \\ \text{i.e. } j_i &= u_i / u \cdot l_i \end{aligned}$$

The share of sector i in total unemployment will depend on the sectoral unemployment percentage relative to the aggregate unemployment percentage, u_i/u , and the proportion of the total labour force in sector i , l_i . This equation will provide the basis of the analysis of the structure of unemployment. A change in the relative

importance of sector i in the labour force, l_i , will change the weighting of that sector's unemployment-vacancy relationship in the determination of the aggregate unemployment-vacancy relationship. This will, other things being equal, change the position of the aggregate u-v relationship and, thus, the level of non demand-deficient unemployment.

An advantage of the above equation is that data on L_i is not necessary to calculate j_i . Assuming constant l_i , changes in j_i will parallel changes in sectoral unemployment percentages relative to the aggregate unemployment percentage. There are two sources of change in relative sectoral unemployment percentages : changes in sectoral demand-deficient unemployment relative to the aggregate level of demand-deficient unemployment and changes in sectoral unemployment-vacancy relationships relative to the aggregate unemployment-vacancy relationship. If previous testing has indicated that changes in sectoral u-v relationships relative to the aggregate u-v relationship have not taken place, the cause of changes in relative sectoral unemployment percentages, assuming constant l_i , will be a redistribution of demand between sectors (i.e. changes in relative levels of demand-deficient unemployment).

A similar relationship exists for a sector's share of total unfilled vacancies, k_i . That is :

$$k_i = v_i/v \cdot l_i$$

This equation will be the basis of the analysis of the structure of unfilled vacancies. Changes in a sector's share of unfilled vacancies, assuming constant l_i , will reflect changes in relative unfilled vacancies percentages for sectors. Analysis of the structure of unfilled vacancies will further explain the factors responsible for

changes in the position of the aggregate unemployment-vacancy relationship and the level of non demand-deficient unemployment.

3.9.3 Dispersion

In addition to the preceding analysis of the structure of unemployment it would be useful to represent the distribution of the u_i around the aggregate unemployment percentage, u , by a pure number. This can be done using a statistical measure of dispersion of the observations, the set of u_i , about the arithmetic mean (i.e. the aggregate unemployment percentage, u). There would be a separate measure of dispersion for each method of dividing the total labour force into sectors. The two measures of dispersion to be used are the standard deviation and the coefficient of variation :

$$(1) \text{ Standard Deviation (s.d.) } \sqrt{\sum 1_i (u_i - u)^2}$$

$$(2) \text{ Coefficient of Variation (c.v.) } \quad \text{s.d.} / u$$

This chapter has presented an outline for the analysis of unemployment, Chapter 4 considers the data available for the Australian labour market for undertaking the proposed analysis.

CHAPTER 4

D A T A

4.1 Introduction

To undertake the analysis of unemployment and testing of relationships outlined in chapter 3, data series are required for the following :

- Unemployment
- Unfilled vacancies
- Supply of labour
- Demand for labour
- Incidence and duration of unemployment
- Incidence and duration of unfilled vacancies
- Labour turnover
- Unemployment and unfilled vacancies by sector
- Structure of unemployment and unfilled vacancies

Data requirements and availability for each of the above factors will be outlined in turn in the ensuing sections of this chapter.

The period chosen for analysis is the decade 1964-73. The main reason for selecting this period is that data from the Labour Force Survey undertaken by the Australian Bureau of Statistics are available as from the first quarter of 1964. Quarterly observations will be used in most cases and a ten year period provides sufficient observations for econometric testing. The following subscripts are used to identify the quarters :

m : March quarter	(January, February, March)
j : June quarter	(April, May, June)
s : September quarter	(July, August, September)
d : December quarter	(October, November, December)

The total period for analysis, 1964_m to 1973_d, can be divided into the following approximate sub-periods : a period of low unem-

ployment, 1964_m to 1966_m; a period of moderate unemployment, 1966_j to 1969_m; another period of low unemployment, 1969_j to 1971_m; a period of high unemployment, 1971_j to 1973_m; and a period of decreasing unemployment, 1973_j to 1973_d.

In order to focus attention on cyclical and secular changes the analysis is conducted throughout in terms of seasonally adjusted data. The method of four-quarter moving averages was applied to series not available in seasonally adjusted form. Though adjusted data will be used it should be emphasised that unemployment and unfilled vacancies are subject to marked seasonal fluctuations and the omission of consideration of seasonal factors in this study is a limitation, albeit one that is necessary in order to concentrate on other factors.

The main sources of data for the analysis are as outlined below :

- (1) Commonwealth Employment Service (C.E.S.) -
 - a. Monthly Review of the Employment Situation (M.R.O.T.E.S.)
 - b. Unpublished data
- (2) Australian Bureau of Statistics (A.B.S.) -
 - a. Labour Force Survey (L.F.S.), a quarterly publication.
 - b. Labour Turnover (L.T.), an annual publication.
 - c. Seasonally Adjusted Indicators (S.A.I.), annual publication.

4.2 Unemployment

Unemployment is the key variable in the analysis and data relating to unemployment comprise time series (1) to (18) in appendix 4.1 . This section outlines the time series data available on unemployment in Australia.

4.2.1 Definitions

There are two main definitions used in the collection of data on unemployment in Australia.

Firstly, "C.E.S. Unemployed Persons" comprise all persons who were still registered for employment with the C.E.S. at the Friday nearest the end of the month, who claimed when registering that they were not employed, and who were seeking full-time employment (i.e. 35 hours or more per week). The definition includes persons referred to employers but whose placement was still unconfirmed, and persons who had recently obtained employment without notifying the C.E.S.

There are certain persons who are specifically excluded from the C.E.S. definition and enumeration of unemployed persons : all persons seeking part-time work or special jobs only, students seeking vacation employment, employed persons seeking other employment and persons seeking casual work only.

This definition of unemployed persons implicitly assumes that at least a part of a person's job seeking activity is registration with the Commonwealth Employment Service and as a result includes all recipients of unemployment benefit. Unemployment benefits are administered by the Department of Social Security, but registration with the C.E.S. is a prerequisite for their receipt. "Unemployment Benefit Recipients" comprise all persons who were receiving unemployment benefit as at the Saturday nearest the end of the month.

Secondly, "L.F.S. Unemployed Persons" comprise all those who, during the week of the survey, did no work at all, and who either :

did not have a job or business and were actively looking for work (including those who stated that they would have looked for work if they had not been temporarily ill or believed no work was available, or had not already made definite arrangements to start work in a new job after the survey week)

or were laid off from their jobs without pay for the whole week (a person who either lost his job or was laid off during the survey week, but did some work at his job during the survey week, is classified as employed).

One of the requirements of the L.F.S. definition is that to be unemployed a person must be actively looking for work. To be actively looking for work means being registered with the C.E.S., or approaching prospective employers, or placing and answering advertisements or writing letters of application, or awaiting the results of recent applications.

Given the above definitions it is possible to identify the following components of unemployed persons (unemployment) :

- (A) Those actively seeking full-time work,
- (B) Those actively seeking part-time work,
- (C) Those who have been temporarily laid off from their employment without pay (expect to be reinstated),
- (D) Those who were not actively looking for work but would have been except that they either believed that no work was available, or they were temporarily ill, or they had made definite arrangements to start work in a new job.

Now, L.F.S. unemployment consists of components A,B,C and D, while C.E.S. unemployment comprises components A,C and D (provided also that the persons concerned are registered for employment with the C.E.S.). One difference between the two definitions of unemployment relates to the inclusion of part-time job seekers, and possibly similar special categories, in the L.F.S. definition of unemployed persons and not in the C.E.S. definition. Another difference relates to the coverage of C.E.S. operations : the proportion of all unemployed persons who actually register for employment with the C.E.S. as part of their job-seeking activities. The Labour Force Survey, although based only on a sample of households throughout Australia, provides estimates of unemployment for the total population. For those eligible for unemployment benefit there is a financial incentive for registration. Apart from the financial factor registration will depend on the efficiency of C.E.S. job-finding activities, as seen

by unemployed persons.

Differences in the enumeration of unemployed persons as between the two definitions are also caused by the fact that there are delays associated with the removal of persons from the register. This means that the C.E.S. enumeration will include persons who are currently employed, but whose names have not been removed from the register. There is no similar problem with respect to the L.F.S. definition. A further difference is that the L.F.S. definition of unemployment requires that a person has done no work at all in the survey week to be considered unemployed. There is no such requirement for the C.E.S. definition. Both these factors tend to increase the level of C.E.S. unemployment relative to L.F.S. unemployment, offsetting the incomplete coverage of the C.E.S. enumeration of unemployed persons.

4.2.2 Data Series on Unemployment Variables

The following data series on unemployment are presented in an appendix to this chapter, appendix 4.1 :

- (1) u_r : registered unemployment percentage
- (2) u_{lf} : labour force survey unemployment percentage
- (3) u_{r-sl} : registered unemployment percentage excluding school leavers.
- (4) u_{sl} : school leavers, unemployed, as a percentage of employment.
- (5) u_{br} : unemployment benefit recipients as a percentage of employment.
- (6) u_{pt} : part-time job seekers as a percentage of employment.

All the above series are expressed in the form of percentages of employment, the employment series being the Labour Force Survey data series on employed persons. Seasonally adjusted data on the unemployment variables, except for part-time job seekers, were available from "Seasonally Adjusted Indicators, 1974"¹. Data on part-time job seekers were obtained from various "Labour Force" bulletins

1. Australian Bureau of Statistics, "Seasonally Adjusted Indicators".

and are available in terms of original data only. The series was seasonally adjusted by means of four quarter moving averages.

In December, 1971 the Australian government introduced the Unemployment Relief Scheme, initially for non-metropolitan areas only and later, February, 1973, it was extended to metropolitan centres. The numbers employed under the scheme represented a significant proportion of the labour force in the period 1972_m to 1973_j. Assuming that those employed as a result of the Unemployment Relief Scheme would otherwise have been unemployed, implicit discontinuity is introduced into the unemployment data. No adjustment has been made for the impact of the Unemployment Relief Scheme.

There was a change in the definition of "School Leavers" dating from July, 1973. Data are available based on the old series for all of 1973. The definition of "School Leavers" for the period 1964-73 comprised persons still at school who notified the C.E.S. that they would leave school before the end of the year if a full-time job were available and persons who had ceased full-time primary or secondary education within the previous three months.

The following brief notes are presented on the unemployment data series :

(1) u_r - this series has a mean value of 1.31 for the period 1964-73 with a minimum of 0.91 and a maximum of 2.07. There are cyclical turning points in 1965_j and 1970_j (minima) and 1967_s and 1972_s (maxima). The series was stable in the period 1965_d to 1969_s with a maximum range of only 0.22 percentage points.

(2) u_{lf} - the mean of this series is 1.61 for the 1964-73 period and there is a minimum of 1.22 and a maximum of 2.56. There are cyclical minima in 1965_m and 1970_j and cyclical maxima in 1967_s and

1972_s (as for u_r). The series exhibited marked stability in the period 1965_d to 1969_s with a range in the values of the observations of only 0.28 percentage points.

(3) u_{r-sl} : this series has a mean of 1.12 with a minimum value of 0.80 and a maximum of 1.74 . The variation in the period 1966_m to 1969_m reached a maximum of only 0.22 percentage points.

(4) u_{sl} : this series varies from 0.11 to 0.33 and has a mean of 0.19. The series is cyclically sensitive and contributes significantly to unemployment in periods of low demand for labour.

(5) u_{br} : the mean of this series for the period 1964-73 is 0.41 with a minimum value of 0.22 and a maximum of 0.82. The series is cyclically sensitive and tends to change more than proportionately with u_r .

(6) u_{pt} : this series has a minimum of 0.17 and a maximum of 0.52 and a mean for the period 1964-73 of 0.28. The series is not cyclically sensitive and has displayed a secular increase over the period, particularly in the latter part thereof.

Table 4.1
Data Series on Unemployment (Annual Averages)

Year	u_r	u_{lf}	u_{r-sl}	u_{sl}	u_{br}	u_{pt}
1964	1.13	1.40	0.96	0.17	0.39	0.21
1965	0.97	1.32	0.84	0.13	0.27	0.23
1966	1.26	1.50	1.11	0.15	0.39	0.22
1967	1.37	1.62	1.20	0.17	0.44	0.23
1968	1.33	1.55	1.14	0.19	0.40	0.27
1969	1.13	1.55	0.95	0.18	0.30	0.29
1970	1.04	1.40	0.89	0.15	0.24	0.28
1971	1.36	1.61	1.16	0.20	0.37	0.28
1972	1.91	2.29	1.62	0.29	0.72	0.40
1973	1.55	1.88	1.28	0.27	0.63	0.43
1964-73	1.31	1.61	1.12	0.19	0.41	0.28

To obtain a clearer picture of the behaviour and relative levels of the unemployment data series, annual averages are presented in table 4.1 . The interrelationship between the various series is best analysed in terms of relative unemployment percentages and these are presented in section 4.2.3 below.

4.2.3 Interrelationship Between Data Series

Data series (7) to (10) in appendix 4.1 concern the relationship between the unemployment data series. In each case the unemployment series is expressed as a ratio of the registered unemployment percentage :

$$(7) \quad u_{lf} / u_r$$

$$(8) \quad u_{sl} / u_r$$

$$(9) \quad u_{br} / u_r$$

$$(10) \quad u_{pt} / u_r$$

With respect to the interrelationship between the data series we are concerned with particular components of unemployment (school leavers, persons seeking part-time employment, unemployment benefit recipients) and with the C.E.S. coverage of unemployment as reflected in the difference between C.E.S. unemployment and L.F.S. unemployment.

Annual averages of data series (7) to (10) are presented in table 4.2 .

Firstly, let us consider the C.E.S. coverage of unemployment (i.e. u_{lf}/u_r). The mean of the u_{lf}/u_r data series for the period 1964-73 is 1.25, suggesting that u_{lf} is greater than u_r by 25 per cent on average (that is, u_r is 80 per cent of u_{lf} on average). The ratio of u_{lf} to u_r is greater in periods of low unemployment, indicating that the availability of jobs in periods of high demand for labour enables unemployed persons to find employment without the assistance

of the C.E.S. The data thus suggest that the C.E.S. coverage of unemployment is incomplete and that this incompleteness is greater in periods of low unemployment. The u_{lf} series does, however, include part-time job seekers who are excluded from the C.E.S. definition. The mean of the u_{lf} series excluding u_{pt} over the period 1964-73 is 1.33, only 0.02 percentage points greater than the mean for u_r . This adjustment to the data series indicates that, numerically, there is only a small difference between u_r and u_{lf} on average. This is likely to be the result of definitional differences and administrative delays in removing unemployed persons from the register rather than complete coverage of unemployed persons on the part of the C.E.S.

Table 4.2

Relative Unemployment Percentages -
(Annual Averages)

Year	u_r	u_{lf}/u_r	u_{sl}/u_r	u_{br}/u_r	u_{pt}/u_r
1964	1.13	1.24	0.15	0.34	0.18
1965	0.97	1.36	0.13	0.28	0.24
1966	1.26	1.19	0.12	0.31	0.18
1967	1.37	1.18	0.13	0.32	0.17
1968	1.33	1.17	0.14	0.30	0.20
1969	1.13	1.38	0.16	0.26	0.27
1970	1.04	1.34	0.15	0.23	0.28
1971	1.36	1.20	0.14	0.27	0.21
1972	1.91	1.20	0.15	0.38	0.20
1973	1.55	1.21	0.18	0.40	0.28
1964-73	1.31	1.25	0.14	0.31	0.22

The u_{lf}/u_r data series in table 4.2 indicates that there was no significant change in the relationship between C.E.S. and L.F.S. unemployment in the 1964-73 period. The only exception to this

is 1969 with a value for u_{lf}/u_r of 1.38, which is high relative to values for 1964 and 1973 (years of similar demand for labour). This does suggest that there may have been a temporary increase in the ratio of L.F.S. to C.E.S. unemployment in 1969-70.

Secondly, consider the data series u_{sl}/u_r presented in table 4.2 . Unemployed school leavers have represented a fairly constant proportion of total unemployment throughout the period 1964-73, although with a tendency to be a little higher in the latter part of the period, particularly 1973. In general, there has been no change in the relationship between u_r and u_{sl} .

Thirdly, observe the proportion of total unemployed persons who receive unemployment benefit, u_{br}/u_r . This proportion varies in the same direction as u_r with the exception of 1973, in which year a decrease in u_r was associated with an increase in u_{br}/u_r . The value of u_{br}/u_r in the period 1969-71 was low relative to values for both earlier and later periods.

Fourthly, consider the behaviour of u_{pt}/u_r . This proportion varies inversely with respect to u_r and showed a tendency to be higher in the latter part of the period. This is likely to reflect the increased participation of females, particularly married women, in the labour force.

4.2.4 Rate of Change in Unemployment

To test for the presence of "loops" in the unemployment-vacancy relationship, data on the direction and rate of change of unemployment are required. Time series (11) to (14) in appendix 4.1 present data series on the rate of change in unemployment for the u_r and u_{lf} series. Two forms of rate of change variable are used : the percentage

rate of change (\dot{u}) and the first difference (Δu) :

$$(11) \quad \dot{u}_r : \text{ measured as } \left[u_{r(t+1)} - u_{r(t-1)} \right] / 2u_{r(t)}$$

$$(12) \quad \Delta u_r : \text{ measured as } \left[u_{r(t+1)} - u_{r(t-1)} \right] / 2$$

$$(13) \quad \dot{u}_{lf} : \text{ measured as } \left[u_{lf(t+1)} - u_{lf(t-1)} \right] / 2 \cdot u_{lf(t)}$$

$$(14) \quad \Delta u_{lf} : \text{ measured as } \left[u_{lf(t+1)} - u_{lf(t-1)} \right] / 2$$

4.2.5 Absolute Unemployment Data

Suitable employment data are not available for sectors for which unemployment and unfilled vacancies data are published. To facilitate comparison between aggregate and sectoral relationships it is necessary to estimate U-V relationships in addition to u-v relationships. Data relating to total unemployment rather than unemployment percentages are presented as data series (15) to (18) in appendix 4.1 :

$$(15) \quad U_r : \text{ total persons registered for employment with the C.E.S.}$$

$$(16) \quad U_{lf} : \text{ total Labour Force Survey unemployed persons}$$

$$(17) \quad \dot{U}_r : \text{ percentage rate of change in total persons registered for employment, measured as....}$$

$$U_{r(t+1)} - U_{r(t-1)} / 2 \cdot U_{r(t)}$$

$$(17) \quad \dot{U}_{lf} : \text{ percentage rate of change in L.F.S. unemployment, measured as } U_{lf(t+1)} - U_{lf(t-1)} / 2 \cdot U_{lf(t)}$$

4.3 Unfilled Vacancies

This section relates to data on unfilled vacancies for Australia. Data series on unfilled vacancies comprise series (19) to (23) in appendix 4.1.

4.3.1 Definition

An "unfilled vacancy" is a job for one worker which is the object

of the active search by an employer for a worker. The active search by employers for labour parallels the search by persons for jobs and includes efforts to fill the vacancies by :

Seeking the assistance of the C.E.S., private employment agencies or unions in locating suitable applicants.

Interviewing and selecting those who make direct application (walk-in or gate applicants).

Using "positions vacant" or other forms of advertising.

Opening and re-opening the acceptance of applications from prospective candidates.

Conducting recruitment programmes.

The main data series on unfilled vacancies available for Australia consists of a compilation of job openings listed by employers with the C.E.S. There is no time series for vacancies, similar to the L.F.S. series on unemployment, which attempts to sample all employers as to the availability of jobs. An unfilled vacancy in the C.E.S. data is a job for one worker offered by an employer and recorded on an employer's form by the employment office. The listing of vacancies with the C.E.S. is voluntary and there is no direct financial incentive for notification as there is with most unemployed persons. The main reason for the registration of vacancies is the placement of persons in suitable employment, particularly those who are currently unemployed and those who are entering or re-entering the labour force.

Vacancies are normally measured in terms of the number remaining on the register at a particular point in time (i.e. as a stock variable).- unfilled vacancies. The definition used by the C.E.S. in the compilation of unfilled vacancies data is given below :

Unfilled vacancies : comprise all job vacancies notified to the C.E.S. which were still unfilled at the Friday nearest the end of the month and which employers claimed could be filled if labour were supplied immediately or within the following month. Vacancies for full-time, part-time, permanent, temporary and seasonal positions are included.

This definition implicitly assumes that notification of the vacancy to the C.E.S. is part of the search by the employer for a worker. The definition is a broad one in the sense that vacancies relating to other than full-time jobs are included.

The C.E.S. also publishes data on "vacancies notified" (a flow variable). This series indicates the number of new job openings notified by employers to the C.E.S. since the previous end-of-month reporting data, expressed in terms of weekly averages. There is also one other series available on vacancies in Australia and this relates to "positions vacant" advertising in one Sydney and one Melbourne newspaper¹. This series, presented in the A.N.Z. Bank publication "Business Indicators",² does not purport to be a close count of vacancies but is a sensitive indicator of changes in the labour market. The "vacancies notified" and "positions vacant" series are considered in section 4.8 .

4.3.2 Data Series

The data on unfilled vacancies are initially presented in the C.E.S. publication, "Monthly Review of the Employment Situation". The actual source used for the data on total unfilled vacancies was "Seasonally Adjusted Indicators". The data were converted to quarterly arithmetic averages, expressed as percentages of employment and the series is presented as data series (19) in appendix 4.1. Comments on the series are presented below :

(19) v : the unfilled vacancies percentage

-
1. The "Sydney Morning Herald" and the "Age" respectively.
 2. A.N.Z. Bank, "Business Indicators".

The mean of the v series for the period 1964-73 is 0.89 with a minimum of 0.57 in 1972_j and a maximum of 1.36 in 1973_s. There are cyclical turning points in 1965_j, 1970_m and 1973_s (maxima) and 1967_d and 1972_j (minima). The v series maximum in 1970 was less than the maximum in 1965, while that in 1973 was greater than in 1970. The cyclical turning points for the v series are very close to those for the u_r series. Annual averages for the v series are presented below :

<u>Year</u>	<u>v</u>
1964	1.02
1965	1.16
1966	0.92
1967	0.77
1968	0.74
1969	0.86
1970	0.96
1971	0.75
1972	0.58
1973	1.14
1964 - 73	0.89

The variables representing the rate of change of unfilled vacancies are similar to those for unemployment : the percentage rate of change in v (\dot{v}) and the first difference of the unfilled vacancies percentage (Δv) :

$$(20) \dot{v} : \text{measured as } (v_{t+1} - v_{t-1}) / 2.v_t$$

$$(21) \Delta v : \text{measured as } (v_{t+1} - v_{t-1}) / 2$$

Data on absolute levels of unfilled vacancies are required for the estimation of U-V relationships and these are presented as data series (22) and (23) in appendix 4.1 :

$$(22) V : \text{total vacancies notified to the C.E.S. remaining unfilled as at the date of enumeration.}$$

$$(23) \dot{V} : \text{percentage rate of change in total unfilled vacancies, measured as } (V_{t+1} - V_{t-1}) / 2.V_t$$

4.4 Comparability of Data on Unemployment and Unfilled Vacancies

This section is concerned with the definitional and empirical comparability as between C.E.S. unemployed persons and C.E.S. unfilled vacancies and between L.F.S. unemployed persons and C.E.S. unfilled vacancies. An estimate of the statement ratio is also presented.

4.4.1 Definitional Comparability

The main basis for comparability between C.E.S. unemployed persons and C.E.S. unfilled vacancies is that both definitions require registration with, or notification to, the same institution. Both unemployed persons and unfilled vacancies are measured in a similar way (i.e. both represent the number on a register) and on the same date. Non-comparability is introduced in that the C.E.S. definition of unfilled vacancies is broader than that for unemployed persons : vacancies for part-time, temporary, and seasonal positions are included in the enumeration of unfilled vacancies. Another definitional difference is that C.E.S. unemployed persons include those who are temporarily laid off, and those who are not actively looking for work because they are temporarily ill or because they believe no jobs are available. These components do not have counterparts in the definition of unfilled vacancies.

The main reason for comparability between L.F.S. unemployed persons and C.E.S. unfilled vacancies is the broadness of the unemployment definition : those seeking part-time, temporary and seasonal employment are included in the definition of unemployed persons. The main reason for non-comparability is the wider coverage of the Labour Force Survey : the C.E.S. is not necessarily involved in the worker search process. The methods by which, and the dates on which, the data are collected also differ. A further dissimilarity relates

to the fact that persons have to be without a job for the whole of the survey week to be considered unemployed. No such requirement exists for unfilled vacancies.

4.2.2 Empirical Comparability

The term "bias" will be used to refer to that which causes the measure of vacancies to fail to correspond to that of unemployment. The major source of bias is that the C.E.S. coverage of unfilled vacancies is less than the C.E.S. and L.F.S. coverage of unemployed persons. The method to be used to adjust for this source of bias has been outlined in section 3.5.4 .

A further possible source of bias is the overstatement of C.E.S. unemployed persons and unfilled vacancies associated with lags in the removal from the registers : some persons registered as unemployed will have found jobs, and some vacancies notified will have been filled. The degree of this overstatement may differ as between unemployment and unfilled vacancies.

The stock of unfilled vacancies at any time will consist of the following basic components :

- (a) those vacancies to which persons have been referred, but confirmation of placement has not been received by the C.E.S.,
- (b) those vacancies notified to the C.E.S. within a short period of the date of enumeration,
- (c) those vacancies which are hard to fill because of a shortage of applicants for the positions,
- (d) those vacancies which are hard-to-fill because of some unfavourable characteristic of the position (e.g. low wages, unfavourable working conditions).

Similar components of the stock of unemployment may also be identified :

- (a) those unemployed persons who have applied for jobs, but confirmation of placement has not been received.
- (b) those who have been unemployed a short time only.
- (c) those who are unable to find employment because there are insufficient jobs available.
- (d) those who are unable to find employment mainly because of some unfavourable personal characteristic.

The basic components of the stock of unfilled vacancies are similar to those of the stock of unemployment, confirming that it is reasonable to compare the two variables and to relate them one to another. Disproportionate amounts of component "d" in unemployment relative to unfilled vacancies could introduce bias, but this is allowed for in the proposed method of estimation of the statement ratio.

4.4.3 Estimate of the Statement Ratio

The proposed method of estimating the statement ratio, s , has been outlined in section 3.5.4. In the estimation of the statement ratio data for the period 1972_j to 1973_d have been excluded on the basis of the reasons outlined in section 3.5.3. That is, the estimates of s are based on the u and v series for the period 1964_m to 1972_m.

With respect to the v series we have :

$$\begin{aligned}\bar{v}_{\min} &= 0.64 \quad (\text{average of } 0.71 \text{ and } 0.58) \\ \bar{v} &= 0.89 \\ \sum_{t=1}^n |v_t - \bar{v}| &= 4.31\end{aligned}$$

For the u_r data series we have :

$$\begin{aligned}\bar{u}_{r(\min)} &= 0.94 \quad (\text{average of } 0.91 \text{ and } 0.98) \\ \bar{u}_r &= 1.22 \\ \sum_{t=1}^n |u_r(t) - \bar{u}_r| &= 5.06\end{aligned}$$

Combining the above two sets of data we have :

$$s' = 0.85 ; \quad s'' = 0.65$$

Therefore, from section 3.5.4, the true level of unfilled vacancies is given by :

$$v' = \bar{v}_{\min} / s'' + (v - \bar{v}_{\min}) / s'$$

$$\text{i.e.} \quad v' = 0.64 / 0.65 + (v - 0.64) / 0.85$$

$$\text{i.e.} \quad \underline{v' = 0.23 + 1.12.v}$$

The method was also applied to the u_{lf} series. We have the following set of data for the series :

$$\bar{u}_{lf(\min)} = 1.30 \quad (\text{minima of 1.22 and 1.37})$$

$$\bar{u}_{lf} = 1.51$$

$$\sum_{t=1}^n |u_{lf(t)} - \bar{u}_{lf(\min)}| = 3.97$$

Combining this set of data with that for v we have :

$$s' = 1.10 ; \quad s'' = 0.49$$

$$\text{Therefore,} \quad \underline{v' = 0.19 + 0.91.v}$$

This result would appear to be inconsistent with the result for the u_r series, assuming that u_{lf} is in general greater than u_r . It is considered likely that the differences between the bases of the v and u_{lf} series render the method of estimating the statement ratio unreliable for the u_{lf} series. The statement ratio, s , estimated on the basis of the u_r series will be used to estimate the level of non demand-deficient unemployment for the u_{lf} series.

4.5 Supply of Labour

Data relating to the supply of labour are presented as data series (24) to (29) in appendix 4.1. The data are based on the L.F.S.

4.5.1 Classification of the Population

The population of working age may be classified into the following categories : not in the labour force, in the labour force - employed, in the labour force - unemployed.

The Australian Bureau of Statistics (A.B.S.) conducts quarterly surveys of the labour force by means of personal interviews with the occupants of a sample of dwellings throughout Australia. The population concept used in the survey relates to all persons aged fifteen years and over, excluding members of the permanent armed forces and certain diplomatic personnel. The concept thus excludes those who are too young to be regarded as potential members of the labour force. The total population is classified according to the following definitions :

Persons not in the labour force : comprise all those who, during the survey week, were not in the categories employed or unemployed. This category includes persons without a job, business or farm who were not actively looking for work. The major activities of persons in this group include keeping house (unpaid), attending an educational institution, retired or voluntarily idle, permanently unable to work and inmates of institutions (gaols, sanatoria, etc.). The category includes persons who worked less than fifteen hours without pay in a family business during the survey week.

The Labour Force comprises all persons in the population who were employed or unemployed during the survey week. Unemployed persons have been defined in section 4.2.1 . Employed persons comprise all those who during the survey week :

did any work for pay, profit, commission or payment in kind, in a job or business, or on a farm. This includes employees, employers and self-employed persons.

or

had a job, business or farm, but were not at work because of illness, accident, leave, holiday, production hold-up due to bad weather, plant breakdown, etc. or because they were on strike.

or

worked fifteen hours or more without pay in a family business or farm (unpaid helpers).

4.5.2 Data Series

The following data series relating to the supply of labour are presented in appendix 4.1 :

- (24) P : persons in the population, as per L.F.S., in thousands.
- (25) L : persons in the labour force, as per L.F.S., in thousands.
- (26) A : participation rate (per cent)

The percentage rates of change for the above series represent data series (27) to (29) :

- (27) p : $(P_{t+1} - P_{t-1}) / 2.F_t$
- (28) l : $(L_{t+1} - L_{t-1}) / 2.L_t$
- (29) a : $(A_{t+1} - A_{t-1}) / 2.A_t$

4.6 Demand for Labour

Data series relating to the demand for labour constitute data series (30) to (37) in appendix 4.1. Data on Gross Non-Farm National Product were obtained from Seasonally Adjusted Indicators, 1974¹. In the measurement of productivity, employment in agriculture is excluded from total employment. This adjusted employment figure is denoted by E' . We have :

- (30) E* : demand for labour, employment plus unfilled vacancies, in thousands of persons.
- (31) E : L.F.S. employed persons, in thousands.

1. Australian Bureau of Statistics, "Seasonally Adjusted Indicators, 1974."

- (32) Y_{nf} : gross non-farm national product, millions of dollars per quarter (constant 1966-67 dollars).
- (33) Q : labour productivity, measured as Y_{nf}/E - dollars per person employed per quarter.

The percentage rates of change in the above variables are presented as data series (34) to (37) in appendix 4.1 .

$$(34) \quad e^* : (E_{t+1}^* - E_{t-1}^*) / 2 \cdot E_t^*$$

$$(35) \quad e : (E_{t+1} - E_{t-1}) / 2 \cdot E_t$$

$$(36) \quad y_{nf} : (Y_{nf(t+1)} - Y_{nf(t-1)}) / 2 \cdot Y_{nf_t}$$

$$(37) \quad q : (Q_{t+1} - Q_{t-1}) / 2 \cdot Q_t$$

4.7 Incidence and Duration of Unemployment

Data series relating to the incidence and duration of unemployment comprise series (38) to (53) in appendix 4.1. There are two sources of data : firstly, unpublished data made available on the flow of new registrants to the C.E.S. and secondly, Labour Force Survey data on the duration of unemployment.

4.7.1 C.E.S. - New Registrants

The derivation of data on the incidence and duration of C.E.S. unemployment was made possible by data on the number of applicants registering for employment with the C.E.S. being made available by the Department of Labour. The raw data, seasonally unadjusted, is available in terms of the number of new applicants per month. Weekly averages for each quarter were obtained by dividing total new applicants for the three months of each quarter by thirteen. The data were seasonally adjusted by means of four quarter moving averages. The basic series in appendix 4.1 are :

- (32) U_{nr} : weekly average for Australia of the number of persons registering for employment.
- (39) I_{ur} : the incidence of C.E.S. unemployment - the percentage of total employed persons who register for employment each week ; given by U_{nr}/E .

The derivation of the data series on the duration of registered unemployment is based on section 3.7.5 . That is, we have

$$u = I_u \cdot D_u$$

$$\text{i.e. } u_r = I_{ur} \cdot D_{ur}$$

$$\text{i.e. } D_{ur} = u_r / I_{ur}$$

Strictly speaking, the above equation applies only in the steady state situation : constant unemployment percentage and constant flow of applicants onto the register. The method implicitly assumes that persons on the register are, on average, halfway through their expected period of unemployment. In periods of changing unemployment this assumption may not hold. For example, in a period of increasing unemployment the persons on the register may be less than halfway through their expected period of unemployment. This factor will tend to cause the calculated value of D_{ur} to be below the real value in times of increasing unemployment and above the true value when unemployment is decreasing. The reason for this is that the observed value of I_{ur} is currently above the I_{ur} value for the time at which the unemployed persons, on average, entered the register (assuming a period of increasing unemployment). That is, the flow of persons onto the register (I_{ur}) is overstated and the period spent on the register (D_{ur}) is understated in a period of increasing unemployment. The reverse will apply when unemployment is decreasing. The method does provide a method of obtaining a reasonable approximation to the D_{ur} series, which is presented as data series (40) in appendix 4.1 .

(40) D_{ur} : the duration of unemployment, in weeks, for C.E.S. unemployed persons.

Data series on the percentage rate of change of the incidence and duration of C.E.S. unemployment are also presented in appendix 4.1 :

$$(41) \quad i_{ur} : (I_{ur(t+1)} - I_{ur(t-1)}) / 2 \cdot I_{ur(t)}$$

$$(42) \quad d_{ur} : (D_{ur(t+1)} - D_{ur(t-1)}) / 2 \cdot D_{ur(t)}$$

Annual data for the incidence and duration of registered unemployment, and the absolute percentage rates of change thereof, are presented in table 4.3 below.

Table 4.3

Incidence and Duration of Registered Unemployment .

Year	I_{ur}	D_{ur}	$ i_{ur} $	$ d_{ur} $
1964	0.328	3.45	2.85	8.99
1965	0.323	3.01	1.84	5.26
1966	0.346	3.66	1.78	3.96
1967	0.345	3.96	2.23	2.13
1968	0.356	3.74	2.00	2.18
1969	0.334	3.38	3.58	5.00
1970	0.332	3.15	3.52	4.44
1971	0.371	3.65	5.00	4.15
1972	0.430	4.45	2.73	7.44
1973	0.369	4.22	4.36	3.65
1964-73	0.353	3.67	2.99	4.72

Over the period 1964-73 the value of I_{ur} averaged 0.353. This means that on average 0.35 per cent of employed persons registered for employment with the C.E.S. each week. That is, approximately eighteen per cent of employed persons registered for employment with

the C.E.S. each year. The incidence of unemployment was relatively stable in the years 1964-70, increased in 1971 and 1972 and then decreased in 1973, although remaining at an higher level than in the period 1964-70.

The average duration of C.E.S. unemployment over the period 1964-73 was 3.67 weeks. Unemployed persons are at any time, on average, half way through their period of unemployment. This means that the average duration of completed unemployment was just over seven weeks. The duration of unemployment exhibited greater variability than the incidence of unemployment in the early years of the decade. The value of D_{ur} increased in 1971 and 1972 and then decreased slightly in 1973.

Looking at the data on the absolute percentage rates of change of I_{ur} and D_{ur} , it is apparent that the duration of unemployment was subject to a greater degree of variability than the incidence of unemployment. This suggests that changes in unemployment are due more to changes in the duration of unemployment than in the incidence of unemployment.

4.7.2 L.F.S. - Duration of Unemployment

Labour Force Survey data are available on the number of persons unemployed for various lengths of time : less than two weeks, two weeks or over and less than four weeks, four weeks or over and under thirteen weeks and thirteen weeks or over. Data series are presented in appendix 4.1 on the proportion of total unemployed persons in the above duration of unemployment categories :

- (43) D_{u1} : less than two weeks
- (44) D_{u2} : two weeks or over and less than four weeks
- (45) D_{u3} : four weeks or over and under thirteen weeks

(46) D_{u4} : thirteen weeks and over

(47) D_{u5} : four weeks or over

Data on the average duration of unemployment, D_{ulf} , associated with the above pattern of distribution of unemployed persons by duration categories are available for later periods, but not for the whole of the period 1964-73. It is possible to derive a series approximating the D_{ulf} series. As mentioned, some data are available on both the distribution of unemployment by duration categories and the average duration of unemployment associated with the distributions. In particular, data are available on D_{ulf} and D_{ui} ($i=1,2,3,4$) for the eight quarters in 1972 and 1973. It is proposed to use these data as a basis for deriving the D_{ulf} series for the period 1964-73.

It is assumed that for each duration category, D_{ui} , there is an average duration of unemployment for persons in that category, $D_{ulf(i)}$. It is further assumed that the average duration of unemployment for each category is fixed, that is, changes in the duration of unemployment are brought about by changes in the proportion of total unemployed persons in each of the duration categories and not by changes in $D_{ulf(i)}$. We have :

$$D_{ulf} = D_{u1} \cdot D_{ulf(1)} + D_{u2} \cdot D_{ulf(2)} + D_{u3} \cdot D_{ulf(3)} + D_{u4} \cdot D_{ulf(4)}$$

Values were substituted in the above equation for $D_{ulf(i)}$ for $i = 1,2,3$. The values were calculated as the mid-point of each of the duration categories, to the nearest week. That is :

$$D_{ulf(1)} = 1 \text{ week} ; \quad D_{ulf(2)} = 3 \text{ weeks} ; \quad \text{and}$$

$$D_{ulf(3)} = 8 \text{ weeks} .$$

The above estimates were substituted in the data for each quarter of the years 1972 and 1973 and the value of $D_{ulf(4)}$ was estimated for

each quarter of 1972 and 1973. The average of the eight estimates of $D_{ulf(4)}$ was 27 weeks. The estimates of $D_{ulf(i)}$ were used in conjunction with data for D_{ui} ($i=1,2,3,4$) to derive a series on the duration of Labour Force Survey unemployment (D_{ulf}) for the period 1964-73. The accuracy of the method was tested by comparing the calculated and observed values of D_{ulf} for 1972 and 1973, as presented in table 4.4 below.

Table 4.4
Calculated and Observed Values of D_{ulf}

<u>Quarter</u>	<u>Observed</u>	<u>Calculated</u>	<u>Difference</u>
	(1)	(2)	(2) - (1)
	weeks	weeks	weeks
1972m	7.0	7.3	0.3
j	7.9	8.8	0.9
s	9.7	9.4	- 0.3
d	9.2	8.5	- 0.7
1973m	8.3	7.8	- 0.5
j	8.4	9.3	0.9
s	9.4	8.8	- 0.6
d	6.3	6.2	- 0.1

The average deviation¹ of observed from calculated is 0.5 weeks. The estimated D_{ulf} series is considered a reasonable approximation to the true series, but results and conclusions based on the series should be viewed with caution. The duration of unemployment series was used to obtain a series on the incidence of unemployment, I_{ulf} , based on the identity :

$$u_{lf} = D_{ulf} \cdot I_{ulf}$$

The data series presented in appendix 4.1 on the duration and incidence of unemployment (L.F.S.) are :

1. In absolute terms.

- (48) D_{ulf} : average duration of Labour Force Survey unemployment, in weeks.
- (49) I_{ulf} : incidence of L.F.S. unemployment, expressed as a percentage.
- (50) d_{ulf} : $(D_{ulf(t+1)} - D_{ulf(t-1)}) / 2 \cdot D_{ulf(t)}$, expressed as a percentage.
- (51) i_{ulf} : $(I_{ulf(t+1)} - I_{ulf(t-1)}) / 2 \cdot I_{ulf(t)}$, expressed as a percentage.

Annual data on the incidence and duration of Labour Force Survey unemployed persons, and the rate of change thereof, are presented in table 4.5 below.

Table 4.5

Incidence and Duration of L.F.S. Unemployment

Year	I_{ulf}	D_{ulf}	$ i_{ulf} $	$ d_{ulf} $
1964	0.104	10.86	5.16	8.38
1965	0.116	8.40	6.79	2.94
1966	0.138	9.16	1.22	5.46
1967	0.160	8.57	3.92	4.62
1968	0.164	8.09	2.74	3.41
1969	0.146	7.75	4.08	4.04
1970	0.156	6.72	6.28	6.90
1971	0.206	6.56	6.46	3.72
1972	0.224	8.50	4.20	4.97
1973	0.197	7.90	6.09	7.47
1964-73	0.161	8.25	4.69	5.19

The incidence of L.F.S. unemployment, I_{ulf} , averaged 0.161 over the period 1964-73. The incidence of unemployment is the proportion of persons employed who enter the state of unemployment each week. This means that for the period 1964-73 just over eight per cent of employed persons experience unemployment each year on average. The incidence of unemployment exhibited a tendency to increase throughout the decade. The value of the duration of unem-

ployment, D_{ulf} , averaged just over eight weeks in the period 1964-73. There is an indication of a secular decline in D_{ulf} . The variability in the duration of unemployment is again greater than for the incidence of unemployment; but the difference in variability is not as great as for registered unemployment.

4.8 Incidence and Duration of Unfilled Vacancies

Data series relating to the incidence and duration of unfilled vacancies are presented in appendix 4.1 as series (52) to (58). In addition to C.E.S. data the following are included :

- (52) V_{pv} : weekly average of "positions vacant" advertised in the Age and Sydney Morning Herald newspapers.
- (53) v_{pv} : "positions vacant" as a percentage of employment.
($v_{pv} = V_{pv} / E$).

Data are available with respect to the weekly average for Australia of vacancies notified to the C.E.S. (V_n). Expressed as a percentage of employment (V_n / E) this series represents the incidence of unfilled vacancies (I_v). Based on section 3.7.7 it is possible to derive a series on the duration of unfilled vacancies (D_v). We have,

$$v = I_v \cdot D_v$$

$$D_v = v / I_v$$

The following data series are presented in appendix 4.1 on the incidence and duration of unfilled vacancies :

- (54) V_n : weekly average for Australia of vacancies notified to the C.E.S.
- (55) I_v : incidence of unfilled vacancies - the weekly average of vacancies notified expressed as a percentage of employment.

(56) D_v : average duration of unfilled vacancies, in weeks

(57) i_v : $(I_{v(t+1)} - I_{v(t-1)}) / 2.I_{vt}$, expressed as a percentage

(58) d_v : $(D_{v(t+1)} - D_{v(t-1)}) / 2.D_{vt}$, expressed as a percentage

Annual data, based on averages of the seasonally adjusted quarterly data, on the incidence and duration of unfilled vacancies and the absolute rates of change thereof are presented in table 4.6 below.

Table 4.6

Incidence and Duration of Unfilled Vacancies

Year	I_v	D_v	$ i_v $	$ d_v $
1964	0.287	3.57	5.09	7.05
1965	0.265	4.39	3.04	4.98
1966	0.242	3.79	2.43	3.28
1967	0.241	3.22	0.87	5.24
1968	0.252	2.94	1.20	1.36
1969	0.268	3.20	1.69	5.16
1970	0.270	3.55	1.34	3.94
1971	0.252	2.98	4.34	7.59
1972	0.282	2.08	5.34	6.70
1973	0.340	3.37	6.76	13.89
1964-73	0.270	3.31	3.21	5.92

Over the period 1964-73 the value of I_v averaged 0.270. This means that on average just over fourteen per cent of filled jobs (employment) enter the vacancy flow each year. The incidence of vacancies was stable in the period 1964-71, increased in 1972 and again and more so in 1973.

The average duration of unfilled vacancies in the 1964-73 period was 3.31 weeks. The duration of unfilled vacancies exhibited greater instability than the incidence of unfilled vacancies. The duration of unfilled vacancies decreased from the levels of 1969-70 in 1971 and 1972 and then increased in 1973.

The data on i_v and d_v indicate that changes in the unfilled vacancies percentage are the result more of changes in D_v than in I_v .

4.9 Turnover in the Labour Force

Data relating to turnover in the Australian labour force is presented in table 4.7 . The source of the data is the A.B.S. publication, "Labour Turnover".¹ Quarterly data are not available and data for March of each year are used in this study. The other data series available, for September, was discontinued as from 1966 .. The data are based on a survey of labour turnover in Australian industry. The actual time period covered in individual survey returns varies, depending on the dates on which payroll tax returns of individual businesses are made up for February and March each year. The average period covered is about four and one half weeks. The data are presented in terms of rates : percentages of average employment during the period under review. The survey is based on a sample within certain industries of businesses subject to the payment of pay-roll tax.

Data on the following are included :

- (1) Engagement rate : gross additions by employers to their work forces.
- (2) Separation rate : gross withdrawals by employees from employment.
- (3) Dismissal rate : terminations of employment by employers for disciplinary or similar reasons.

1. Australian Bureau of Statistics, "Labour Turnover".

Table 4.7

Labour Turnover .

YEAR	ENGAGEMENT RATE (z)				SEPARATION RATE (s)			
	mnm	mm	fnm	fm	mnm	mm	fnm	fm
1964	2.2	6.5	4.5	7.7	2.2	6.4	4.8	6.5
1965	2.7	8.6	4.8	9.9	2.4	7.9	4.4	8.1
1966	2.8	7.5	5.1	8.5	2.5	7.1	4.7	7.9
1967	2.5	6.4	4.4	8.5	2.4	6.4	4.1	7.5
1968	2.5	7.0	4.7	8.6	2.4	6.7	4.2	7.8
1969	2.8	7.2	5.1	9.9	2.5	6.7	4.6	8.1
1970	3.0	7.6	5.2	9.6	2.7	7.5	4.8	8.7
1971	3.2	8.7	6.1	11.0	3.0	8.2	5.2	8.8
1972	2.4	6.8	5.1	9.2	2.4	6.7	4.8	9.2
1973	3.1	8.3	6.1	10.8	2.9	8.0	4.7	9.3

YEAR	DISMISSED (f_{ed})		RETRENCHED (f_{el})		QUIT RATE (f_{eq})		RETIREMENTS (f_{en})	
	mm	fm	mm	fm	mn	fm	mm	fm
1964	0.8	0.8	0.9	1.3	4.6	4.2	0.1	0.2
1965	0.9	0.8	0.8	1.0	6.1	6.1	0.1	0.2
1966	0.9	0.9	0.9	1.3	5.2	5.7	0.1	0.1
1967	0.9	0.9	1.2	1.0	4.1	5.5	0.2	0.1
1968	1.0	1.0	0.9	0.9	4.6	5.7	0.1	0.1
1969	0.9	1.0	1.0	0.9	4.6	6.1	0.1	0.1
1970	1.0	0.7	0.8	0.8	5.6	7.0	0.1	0.1
1971	1.1	0.9	1.1	1.0	5.9	6.6	0.2	0.2
1972	1.0	0.9	1.4	1.6	4.2	6.6	0.2	0.2
1973	1.0	0.7	0.9	1.3	6.0	7.1	0.2	0.2

mnmm : male, non-manual workers
 mn : male, manual workers
 fnm : female, non-manual workers
 fm : female, manual workers

- (4) Retrenchment rate : terminations of employment by employers by reason of a reduction in the scale of operations, completion of job, etc.
- (5) Quit rate : terminations of employment by employees in order to seek or take up alternative employment.
- (6) Retirement rate : terminations of employment associated with leaving the labour force.

4.10 Sectoral Unemployment and Unfilled Vacancies

C.E.S. data on unemployment and unfilled vacancies for sectors of the labour force are presented in appendix 4.2.1. The data are in terms of numbers of unemployed persons and unfilled vacancies because of incomparability between the C.E.S. and the L.F.S. (employment) sectoral classifications. The number of unemployed persons in a sector is denoted by U_i and the number of unfilled vacancies by V_i , where i is a subscript representing the sector. An outline of the sectors for which U_i and V_i are available and the subscripts applicable to these sectors is presented at the beginning of appendix 4.2.1.

Data are presented for seven occupational sectors, four demographic (age-sex) sectors, nine geographical sectors and six industries. The nine geographical sectors comprise the six States of Australia with a breakdown into metropolitan and non-metropolitan for N.S.W., Victoria and Queensland. A similar dichotomy was not adopted for South Australia and Western Australia because of the concentration of unemployment and unfilled vacancies in the capital city. Tasmania's small relative size was the reason for not separating metropolitan and non-metropolitan unemployment and unfilled vacancies for that State.

Appendix 4.2.2 presents the following data, on an annual basis, for each of the sectors of the labour force.

$$j_i = U_i / U$$

$$k_i = V_i / V$$

That is, the appendix presents data relating to each sector's share of unemployment and unfilled vacancies. These data will be used in determining whether redistributions of unemployment and unfilled vacancies between sectors have occurred.

4.11 Sectoral Data : Structure of Unemployment

The Labour Force Survey provides data on the structure of the labour force and unemployment and these data are presented in Appendix 4.3 (C.E.S. State unemployment percentages are also included). Annual data, based on averages of quarterly data, are presented for the following variables :

- (1) U_i : number of unemployed persons in sector i
- (2) U_i/U : sector i's share of total unemployment
- (3) U_i/L_i : unemployment percentage for sector i (i.e. u_i)
- (4) L_i : number of persons in the labour force in sector i
- (5) L_i/L : share of sector i in the total labour force
- (6) u_i/u : sector i's relative unemployment percentage

Limited data only are available for geographical sectors and a change in the classification of industries for the Labour Force Survey means that data for industrial sectors for 1972 and 1973 are not comparable with earlier periods.

Appendix 4.1Aggregate Labour Market Variables -Key to Data Series.(1) Unemployment

- (1) u_r : registered unemployment percentage
- (2) u_{lf} : labour force survey unemployment percentage
- (3) u_{r-sl} : registered unemployment percentage excluding school leavers
- (4) u_{sl} : unemployed school leavers as a percentage of employment
- (5) u_{br} : unemployment benefit recipients as a percentage of employment
- (6) u_{pt} : part-time job seekers as a percentage of employment
- (7) u_{lf} / u_r
- (8) u_{sl} / u_r
- (9) u_{br} / u_r
- (10) u_{pt} / u_r
- (11) \dot{u}_r : percentage rate of change in registered unemployment percentage
- (12) Δu_r : first difference of registered unemployment percentage
- (13) \dot{u}_{lf} : percentage rate of change in labour force survey unemployment percentage
- (14) Δu_{lf} : first difference of labour force survey unemployment percentage
- (15) U_r : total registered unemployed persons
- (16) U_{lf} : total labour force survey unemployed persons
- (17) \dot{U}_r : percentage rate of change in registered unemployed
- (18) \dot{U}_{lf} : percentage rate of change of L.F.S. unemployment

(2) Unfilled Vacancies

- (19) v : unfilled vacancies percentage
- (20) \dot{v} : percentage rate of change in the unfilled vacancies percentage

- (21) v : first difference of unfilled vacancies percentage
- (22) V : total unfilled vacancies
- (23) \dot{V} : percentage rate of change in total unfilled vacancies

(3) Supply of Labour

- (24) P : population of working age (thousands)
- (25) L : persons in the labour force (thousands)
- (26) A : participation rate (per cent)
- (27) p : percentage rate of change in the population of working age
- (28) l : percentage rate of change in the labour force
- (29) a : percentage rate of change in the participation rate

(4) Demand for Labour

- (30) E^* : demand for labour (thousands of persons)
- (31) E : employment (thousands of persons)
- (32) Y_{nf} : gross non-farm national product in millions of dollars per quarter (constant 1966-67 dollars)
- (33) Q : labour productivity (dollars per person employed per quarter)
- (34) e^* : percentage rate of change in the demand for labour
- (35) e : percentage rate of change in employment
- (36) y_{nf} : percentage rate of change in gross non-farm national product
- (37) q : percentage rate of change in labour productivity

(5) Incidence and Duration of Unemployment

- (38) U_{nr} : weekly average of number of persons registering for employment with the C.E.S.
- (39) I_{ur} : the incidence of C.E.S. unemployment (per cent)
- (40) D_{ur} : the duration of C.E.S. unemployment (weeks)
- (41) i_{ur} : percentage rate of change in the incidence of C.E.S. unemployment
- (42) d_{ur} : percentage rate of change in the duration of C.E.S. unemployment
- (43) D_{ul} : proportion unemployed less than two weeks (L.F.S. unemployment)
- (44) D_{u2} : proportion unemployed two weeks or over and less than four weeks

- (45) D_{u3} : proportion unemployed four weeks or over and under thirteen weeks
- (46) D_{u4} : proportion unemployed thirteen weeks or over
- (47) D_{u5} : proportion unemployed four weeks and over
- (48) D_{ulf} : average duration of L.F.S. unemployment (weeks)
- (49) I_{ulf} : the incidence of L.F.S. unemployment (percentage)
- (50) d_{ulf} : percentage rate of change in the average duration of L.F.S. unemployment
- (51) i_{ulf} : percentage rate of change in the incidence of L.F.S. unemployment

(6) Incidence and Duration of Unfilled Vacancies

- (52) V_{pv} : weekly average of "positions vacant" advertised in the "Age" and "Sydney Morning Herald" newspapers
- (53) v_{pv} : "positions vacant" as a percentage of employment
- (54) V_n : weekly average of vacancies notified to the C.E.S.
- (55) I_v : the incidence of unfilled vacancies (percentage)
- (56) D_v : the average duration of unfilled vacancies (weeks)
- (57) i_v : percentage rate of change in the incidence of unfilled vacancies
- (58) d_v : percentage rate of change in the average duration of unfilled vacancies

Quarter	(7) $\frac{u_{jf}}{u_r}$	(8) $\frac{u_{sl}}{u_r}$	(9) $\frac{u_{br}}{u_r}$	(10) $\frac{u_{pt}}{u_r}$	(11) u_r	(12) Δu_r
64m j s d	1.15 1.28 1.28 1.26	0.15 0.16 0.16 0.14	0.39 0.34 0.33 0.30	0.16 0.22 0.22 0.20	-13.43 -12.93 -8.17 -4.55	-0.18 -0.15 -0.08 -0.04
65m j s d	1.28 1.35 1.43 1.37	0.14 0.12 0.13 0.14	0.29 0.29 0.27 0.28	0.21 0.25 0.28 0.22	-2.11 -0.55 9.57 11.93	-0.04 0.00 0.09 0.13
66m j s d	1.27 1.16 1.21 1.12	0.12 0.11 0.11 0.12	0.28 0.30 0.32 0.33	0.19 0.20 0.15 0.17	5.42 4.51 4.20 0.75	0.06 0.05 0.05 0.01
67m j s d	1.18 1.20 1.19 1.17	0.13 0.12 0.13 0.13	0.32 0.33 0.32 0.31	0.16 0.17 0.18 0.16	1.88 3.26 -1.41 -1.49	0.02 0.04 -0.02 -0.02
68m j s d	1.14 1.16 1.18 1.19	0.13 0.15 0.15 0.13	0.31 0.29 0.29 0.29	0.17 0.19 0.23 0.21	1.81 -3.24 -5.04 -2.78	0.02 -0.05 -0.06 -0.03
69m j s d	1.25 1.29 1.39 1.58	0.15 0.15 0.15 0.18	0.28 0.27 0.25 0.25	0.24 0.27 0.27 0.29	-4.10 -7.33 -3.81 -2.31	-0.05 -0.03 -0.04 -0.02
70m j s d	1.40 1.40 1.28 1.29	0.15 0.13 0.15 0.16	0.25 0.22 0.23 0.23	0.23 0.32 0.25 0.25	-5.00 4.52 5.96 4.05	-0.05 0.04 0.06 0.04
71m j s d	1.25 1.23 1.14 1.16	0.14 0.13 0.15 0.14	0.24 0.26 0.28 0.30	0.25 0.21 0.21 0.16	6.36 8.33 11.87 11.64	0.07 0.10 0.16 0.18
72m j s d	1.22 1.02 1.24 1.26	0.14 0.15 0.16 0.16	0.35 0.37 0.40 0.38	0.19 0.14 0.22 0.27	8.24 8.24 0.97 -11.98	0.14 0.15 0.02 -0.23
73m j s d	1.35 1.20 1.11 1.10	0.15 0.20 0.20 0.17	0.40 0.42 0.41 0.39	0.31 0.25 0.28 0.27	-10.56 -2.85 -3.57 -1.33	-0.17 -0.04 -0.04 -0.01

Quarter	(1) u_r	(2) u_{jf}	(3) u_{r-sl}	(4) u_{sl}	(5) u_{br}	(6) u_{ft}
64m j s d	1.34 1.16 1.04 0.99	1.54 1.48 1.33 1.25	1.14 0.98 0.87 0.85	0.20 0.18 0.17 0.14	0.52 0.40 0.34 0.30	0.21 0.25 0.17 0.20
65m j s d	0.95 0.91 0.94 1.09	1.22 1.23 1.34 1.49	0.82 0.80 0.82 0.94	0.13 0.11 0.12 0.15	0.28 0.26 0.25 0.30	0.20 0.23 0.26 0.24
66m j s d	1.20 1.22 1.31 1.33	1.52 1.41 1.50 1.49	1.05 1.08 1.16 1.17	0.15 0.14 0.15 0.16	0.34 0.37 0.42 0.44	0.23 0.24 0.19 0.23
67m j s d	1.33 1.38 1.42 1.34	1.57 1.65 1.69 1.57	1.16 1.22 1.24 1.17	0.17 0.16 0.18 0.17	0.43 0.45 0.45 0.42	0.21 0.24 0.25 0.22
68m j s d	1.38 1.39 1.29 1.26	1.58 1.61 1.52 1.50	1.20 1.18 1.10 1.09	0.18 0.21 0.19 0.17	0.43 0.41 0.37 0.37	0.23 0.27 0.30 0.27
69m j s d	1.22 1.16 1.05 1.00	1.53 1.50 1.46 1.71	1.04 0.99 0.89 0.89	0.18 0.17 0.16 0.19	0.34 0.31 0.26 0.27	0.29 0.28 0.28 0.31
70m j s d	1.00 0.98 1.09 1.11	1.40 1.37 1.39 1.43	0.85 0.85 0.93 0.93	0.15 0.13 0.16 0.13	0.25 0.22 0.25 0.26	0.28 0.31 0.27 0.28
71m j s d	1.18 1.26 1.39 1.59	1.48 1.55 1.58 1.84	1.01 1.09 1.18 1.36	0.17 0.17 0.21 0.23	0.28 0.33 0.39 0.48	0.30 0.27 0.29 0.26
72m j s d	1.76 1.88 2.07 1.92	2.15 2.05 2.56 2.41	1.51 1.60 1.74 1.61	0.25 0.28 0.33 0.31	0.52 0.69 0.82 0.73	0.34 0.27 0.45 0.52
73m j s d	1.61 1.58 1.52 1.50	2.17 1.89 1.68 1.77	1.37 1.29 1.22 1.24	0.24 0.29 0.30 0.26	0.65 0.66 0.62 0.58	0.50 0.40 0.43 0.40

Quarter	(13) \bar{u}_{lf}	(14) Δu_{lf}	(15) u_r	(16) u_{lf}	(17) \bar{u}_r	(18) \bar{u}_{lf}
64m	- 3.90	-0.03	59867	68.6	-13.36	- 3.50
j	- 7.09	-0.10	51870	66.2	-12.72	- 6.50
s	- 8.65	-0.11	46668	60.0	- 7.29	- 8.08
d	- 4.40	-0.05	45062	56.5	- 3.71	- 3.72
65m	- 0.82	-0.01	43320	55.8	- 3.66	0.03
j	4.88	0.06	42895	56.8	0.24	5.46
s	9.70	0.13	43520	62.0	10.36	10.48
d	6.04	0.09	50913	69.8	12.92	6.88
66m	- 2.63	-0.04	56681	71.6	6.15	- 2.03
j	2.48	0.03	57888	66.9	5.09	3.51
s	2.52	0.04	62572	76.3	5.01	3.01
d	- 0.67	-0.01	64163	71.5	1.42	- 2.80
67m	5.41	0.08	64358	75.9	2.36	5.93
j	3.61	0.06	67206	80.5	3.79	4.41
s	- 2.66	-0.04	69498	83.0	- 0.87	- 1.81
d	- 3.50	-0.05	65991	77.5	- 0.80	- 3.16
68m	1.27	0.02	68436	78.1	2.44	1.73
j	- 1.86	-0.03	69331	80.2	- 2.51	- 1.00
s	- 3.52	-0.05	64955	76.5	- 4.60	- 3.01
d	0.33	0.00	63351	75.6	- 2.35	1.12
69m	0.00	0.00	61975	78.2	- 3.05	0.64
j	- 1.33	-0.03	59573	76.6	- 6.34	- 1.70
s	7.19	-0.10	54416	75.6	- 2.85	6.20
d	- 1.75	-0.03	56469	89.0	- 1.46	- 1.01
70m	-12.14	-0.17	52768	78.8	- 4.06	-10.84
j	- 0.36	0.00	52185	73.0	5.12	0.55
s	2.16	0.03	58110	74.6	6.58	2.68
d	3.15	0.04	59838	77.0	4.76	3.51
71m	4.05	0.06	63802	80.0	6.72	4.69
j	3.23	0.05	58419	84.5	8.71	3.67
s	9.18	0.14	75727	86.2	12.05	9.16
d	15.49	0.28	86676	100.3	11.83	15.65
72m	4.98	0.10	56238	117.6	8.48	5.23
j	10.00	0.20	102966	112.6	8.78	10.61
s	7.03	0.18	114334	141.5	1.94	7.70
d	- 8.09	-0.19	107429	134.4	-11.28	- 7.25
73m	-11.98	-0.26	50108	122.0	-10.31	-11.52
j	-12.96	-0.24	63851	106.3	- 2.03	-12.32
s	- 3.57	-0.10	86503	95.8	- 1.76	- 2.40
d	2.54	0.04	85802	101.7	- 0.82	2.90

Quarter	(19) \bar{v}	(20) \bar{v}	(21) $\Delta \bar{v}$	(22) \bar{v}	(23) \bar{v}
64m	0.85	18.82	0.16	37934	19.65
j	1.01	12.87	0.13	45388	13.23
s	1.11	4.50	0.05	49943	5.11
d	1.11	2.70	0.03	50488	3.58
65m	1.17	5.56	0.06	53554	6.11
j	1.24	0.00	0.00	57029	0.85
s	1.17	- 6.84	- 0.08	54519	- 5.95
d	1.03	- 9.26	- 0.10	50595	- 8.80
66m	0.97	- 9.28	- 0.09	45612	- 8.84
j	0.90	- 4.44	- 0.04	42535	- 3.76
s	0.89	0.56	0.00	42410	1.26
d	0.91	- 2.75	- 0.02	43604	- 1.81
67m	0.84	- 5.95	- 0.05	40835	- 5.18
j	0.81	- 6.79	- 0.05	39374	- 6.23
s	0.73	- 6.85	- 0.05	35854	- 5.78
d	0.71	0.70	0.00	35228	0.97
68m	0.74	1.35	0.01	36534	1.74
j	0.73	0.68	0.00	36503	1.77
s	0.75	0.67	0.00	37827	1.21
d	0.74	0.00	0.00	37419	0.63
69m	0.75	6.00	0.04	38298	6.82
j	0.33	10.24	0.08	42646	10.83
s	0.92	5.98	0.05	47536	6.47
d	0.94	5.32	0.05	48794	6.58
70m	1.02	3.43	0.03	53960	4.44
j	1.01	- 5.45	- 0.05	53521	- 5.00
s	0.91	- 6.04	- 0.05	48598	- 5.46
d	0.90	- 2.78	- 0.02	48273	- 2.38
71m	0.86	- 8.14	- 0.07	46301	- 7.69
j	0.76	- 9.87	- 0.07	41154	- 8.91
s	0.71	- 6.34	- 0.04	33970	- 5.76
d	0.67	- 9.70	- 0.06	36661	- 9.87
72m	0.58	- 8.62	- 0.05	31732	- 8.37
j	0.57	0.88	0.00	31349	0.88
s	0.59	2.54	0.01	32884	3.74
d	0.60	2.25	0.13	33766	23.73
73m	0.86	30.23	0.26	48312	30.30
j	1.12	22.32	0.25	63036	23.16
s	1.36	3.68	0.05	77515	4.57
d	1.22	-11.48	- 0.14	70126	-10.54

Quarter	(24) F	(25) L	(26) A	(27) p	(28) 1	(29) a	(30) E*
64m	7699.3	4528.7	58.82	0.53	0.47	-0.17	4498.0
j	7743.5	4549.8	58.72	0.43	0.38	-0.22	4528.0
s	7782.7	4563.1	58.56	0.51	0.49	-0.02	4553.0
d	7826.4	4594.2	58.70	0.61	0.78	0.27	4588.2
65m	7869.5	4634.7	58.89	0.59	0.85	0.25	4632.5
j	7920.2	4672.9	59.00	0.49	0.76	0.15	4673.1
s	7961.1	4705.7	59.07	0.52	0.73	0.24	4698.2
d	8006.9	4741.8	59.27	0.61	0.77	0.29	4722.6
66m	8043.9	4779.1	59.41	0.52	0.69	0.17	4753.1
j	8086.6	4807.9	59.46	0.54	0.85	0.20	4783.5
s	8150.5	4860.7	59.54	0.60	0.75	0.17	4826.8
d	8182.9	4880.7	59.65	0.57	0.53	0.07	4852.8
67m	8223.7	4912.3	59.73	0.52	0.60	0.07	4877.2
j	8270.5	4939.2	59.72	0.46	0.69	0.12	4898.1
s	8318.8	4980.1	59.87	0.54	0.67	0.13	4932.7
d	8358.8	5005.6	59.88	0.61	0.52	0.03	4962.3
68m	8401.5	5032.2	59.90	0.55	0.62	0.07	4990.6
j	8452.8	5067.7	59.95	0.49	0.64	0.03	5024.0
s	8504.7	5097.3	59.94	0.62	0.50	-0.10	5058.6
d	8556.1	5119.1	59.83	0.69	0.78	0.20	5080.9
69m	8601.6	5176.9	60.19	0.54	0.78	0.23	5137.0
j	8651.0	5200.2	60.11	0.46	0.61	0.03	5166.2
s	8701.9	5240.5	60.22	0.63	1.00	0.40	5212.4
d	8758.0	5305.5	60.58	0.72	1.02	0.43	5265.3
70m	8806.2	5348.8	60.74	0.53	0.77	0.23	5324.0
j	8854.4	5387.4	60.85	0.40	0.69	0.16	5368.0
s	8897.6	5423.4	60.95	0.59	0.67	0.10	5397.4
d	8956.3	5460.5	60.97	0.73	0.55	-0.07	5431.8
71m	9006.8	5483.1	60.88	0.52	0.60	0.07	5449.4
j	9052.4	5526.4	61.05	0.36	0.50	0.02	5482.1
s	9093.5	5537.9	60.90	0.51	0.19	-0.31	5490.7
d	9142.7	5546.9	60.67	0.65	0.36	-0.16	5482.3
72m	9190.1	5578.2	60.70	0.43	0.46	0.03	5492.3
j	9223.8	5598.3	60.70	0.15	0.72	0.46	5517.0
s	9239.0	5658.8	61.25	0.40	1.06	0.05	5549.6
d	9295.7	5718.1	61.51	0.69	0.68	0.10	5617.5
73m	9344.7	5736.1	61.38	0.44	0.08	-0.37	5662.4
j	9380.0	5726.8	61.05	0.21	0.45	0.11	5683.5
s	9407.0	5787.4	61.52	0.44	0.96	0.54	5769.1
d	9460.2	5837.7	61.71	0.72	0.87	0.31	5806.1

Quarter	(31) E	(32) Y _{nf}	(33) Q	(34) e*	(35) e	(36) Y _{nt}	(37) q
64m	4460.1	4291	1070.5	0.67	0.53	2.75	2.00
j	4483.6	4409	1091.9	0.61	0.48	2.63	1.22
s	4503.1	4523	1097.2	0.66	0.60	2.14	1.57
d	4537.7	4603	1126.3	0.87	0.84	1.18	0.97
65m	4578.9	4632	1119.1	0.92	0.86	1.90	0.84
j	4616.1	4779	1145.2	0.70	0.70	1.80	1.04
s	4643.7	4804	1142.9	0.53	0.60	-0.06	-0.70
d	4672.0	4776	1129.1	0.58	0.63	-0.24	-1.07
66m	4707.5	4731	1138.7	0.64	0.73	0.52	-0.38
j	4741.9	4826	1120.6	0.77	0.81	1.34	0.36
s	4784.4	4910	1126.7	0.72	0.71	1.36	0.50
d	4809.2	4960	1131.9	0.52	0.54	2.21	1.70
67m	4836.4	5129	1165.2	0.46	0.51	2.24	1.79
j	4858.7	5190	1173.5	0.57	0.62	0.78	0.05
s	4897.1	5210	1166.3	0.66	0.71	0.81	-0.05
d	4928.1	5274	1172.3	0.58	0.58	1.80	1.23
68m	4954.1	5400	1195.1	0.61	0.60	1.84	1.16
j	4987.5	5473	1200.0	0.68	0.67	1.27	0.42
s	5020.8	5539	1205.1	0.56	0.56	1.58	0.99
d	5043.5	5648	1223.8	0.77	0.77	1.61	0.72
69m	5098.7	5721	1222.7	0.83	0.79	1.74	0.74
j	5123.6	5847	1241.9	0.73	0.65	2.18	1.54
s	5164.9	5976	1260.9	0.95	0.90	1.83	0.94
d	5216.5	6066	1265.5	1.06	1.01	0.20	-0.50
70m	5270.0	6000	1238.0	0.96	0.93	1.51	0.50
j	5314.4	6247	1278.0	0.68	0.74	2.26	1.47
s	5348.8	6282	1275.6	0.59	0.55	0.42	-0.37
d	5383.5	6300	1268.6	0.48	0.50	1.05	0.50
71m	5403.1	6414	1288.3	0.47	0.54	0.90	0.30
j	5441.9	6415	1276.3	0.38	0.45	0.64	-0.03
s	5451.7	6496	1287.5	0.00	0.04	0.76	0.68
d	5446.6	6514	1293.8	0.01	0.08	0.18	0.17
72m	5460.6	6520	1291.1	0.31	0.36	0.74	0.28
j	5485.7	6610	1301.0	0.52	0.52	1.34	0.77
s	5517.3	6697	1312.0	0.91	0.89	1.49	0.34
d	5583.7	6809	1310.0	1.00	0.87	2.36	1.09
73m	5614.1	7019	1340.6	0.58	0.33	2.09	1.74
j	5620.5	7103	1356.7	0.94	0.65	1.14	0.44
s	5691.6	7181	1352.6	1.06	1.01	0.96	-0.12
d	5736.0	7241	1353.5	0.64	0.78	0.84	0.03

Quarter	(38) U nr	(39) I ur	(40) D ur	(41) i ur	(42) d ur
64m	14681	0.329	4.07	3.34	-16.22
j	15249	0.340	3.41	1.03	-14.22
s	15143	0.336	3.10	-4.91	- 3.06
d	13915	0.307	3.22	-2.12	- 2.48
65m	14772	0.323	2.94	1.08	- 5.44
j	14487	0.314	2.90	0.00	- 0.52
s	15019	0.323	2.91	2.63	6.70
d	15443	0.331	3.29	3.63	8.36
66m	16335	0.347	3.46	3.17	2.46
j	16713	0.353	3.46	0.00	4.62
s	16609	0.347	3.78	-2.31	6.48
d	16220	0.337	3.95	-1.63	2.28
67m	16255	0.336	3.96	3.57	- 1.64
j	17549	0.362	3.82	0.83	2.49
s	16756	0.342	4.15	-2.76	1.20
d	16832	0.342	3.92	1.75	- 3.19
68m	17535	0.354	3.90	2.12	- 0.38
j	17830	0.357	3.89	-1.68	- 1.67
s	17172	0.342	3.77	1.50	- 6.37
d	18657	0.370	3.41	-2.30	- 0.29
69m	16568	0.325	3.75	-6.00	1.20
j	16968	0.331	3.50	0.76	- 8.14
s	17029	0.330	3.18	3.18	- 8.04
d	18346	0.352	3.07	-4.40	2.61
70m	15775	0.299	3.34	-3.18	- 1.95
j	17630	0.333	2.94	9.31	- 5.44
s	19293	0.361	3.02	0.42	5.96
d	18090	0.336	3.30	-1.19	4.39
71m	19264	0.357	3.31	3.22	3.17
j	19526	0.359	3.51	1.81	6.41
s	20156	0.370	3.76	3.14	6.65
d	21603	0.397	4.01	11.84	0.37
72m	25313	0.464	3.79	2.59	6.12
j	23100	0.421	4.47	- 5.34	12.86
s	23113	0.419	4.94	- 0.24	1.32
d	23260	0.417	4.60	- 2.76	- 9.46
73m	22243	0.396	4.07	- 6.06	- 3.93
j	20713	0.369	4.28	- 6.50	3.50
s	19789	0.348	4.37	- 1.01	- 1.60
d	20750	0.362	4.14	3.87	- 5.56

Quarter	(43) D ul	(44) D u2	(45) D u3	(46) D u4	(47) D u5
64m	0.185	0.174	0.310	0.331	0.359
j	0.214	0.222	0.284	0.280	0.436
s	0.242	0.203	0.260	0.295	0.445
d	0.201	0.257	0.311	0.231	0.458
65m	0.252	0.297	0.245	0.206	0.449
j	0.254	0.264	0.293	0.189	0.518
s	0.274	0.263	0.278	0.185	0.537
d	0.286	0.280	0.247	0.187	0.566
66m	0.269	0.255	0.291	0.185	0.524
j	0.269	0.225	0.287	0.219	0.494
s	0.260	0.270	0.242	0.228	0.530
d	0.263	0.238	0.235	0.264	0.501
67m	0.249	0.268	0.288	0.195	0.517
j	0.263	0.272	0.242	0.223	0.535
s	0.243	0.266	0.277	0.214	0.509
d	0.208	0.311	0.345	0.136	0.519
68m	0.215	0.237	0.370	0.178	0.452
j	0.229	0.283	0.326	0.162	0.512
s	0.210	0.317	0.316	0.157	0.527
d	0.229	0.311	0.311	0.149	0.540
69m	0.214	0.303	0.298	0.185	0.517
j	0.255	0.288	0.293	0.164	0.543
s	0.247	0.304	0.334	0.115	0.551
d	0.296	0.272	0.268	0.164	0.568
70m	0.272	0.282	0.299	0.147	0.554
j	0.288	0.319	0.310	0.083	0.607
s	0.272	0.252	0.332	0.104	0.564
d	0.268	0.312	0.300	0.120	0.590
71m	0.291	0.322	0.283	0.104	0.613
j	0.223	0.355	0.314	0.108	0.578
s	0.268	0.327	0.302	0.103	0.595
d	0.246	0.307	0.341	0.106	0.553
72m	0.204	0.283	0.355	0.158	0.487
j	0.208	0.271	0.368	0.133	0.479
s	0.171	0.258	0.393	0.179	0.429
d	0.206	0.233	0.379	0.182	0.439
73m	0.224	0.287	0.309	0.130	0.511
j	0.226	0.296	0.318	0.160	0.522
s	0.226	0.285	0.319	0.170	0.511
d	0.246	0.286	0.355	0.113	0.532

Quarter	(48) D _{ulf}	(49) I _{ulf}	(50) d _{ulf}	(51) i _{ulf}	(52) V _{pv}	(53) v _{pv}
64m	12.12	0.111	-11.63	- 2.70	11904	0.267
j	10.71	0.108	- 5.70	- 7.41	14105	0.315
s	10.90	0.095	- 4.64	- 3.16	14765	0.328
d	9.70	0.102	-11.54	7.35	14896	0.328
65m	8.66	0.110	- 6.99	2.27	15821	0.346
j	8.49	0.107	- 2.24	1.87	16048	0.347
s	8.28	0.114	- 2.05	11.84	14704	0.317
d	8.15	0.134	0.49	11.19	13375	0.286
66m	8.36	0.144	5.98	0.35	12773	0.271
j	9.15	0.133	4.37	- 0.38	12233	0.258
s	9.16	0.143	4.59	0.00	12138	0.254
d	9.99	0.133	- 6.91	4.14	12233	0.254
67m	8.62	0.154	- 5.57	6.49	12578	0.260
j	9.04	0.153	2.32	0.98	13340	0.275
s	9.04	0.157	- 8.19	7.64	11405	0.273
d	7.57	0.177	- 2.38	0.56	13003	0.264
68m	8.69	0.159	2.76	- 1.57	12780	0.258
j	8.06	0.172	- 4.71	1.16	13303	0.267
s	7.93	0.163	- 2.62	- 2.45	14724	0.293
d	7.67	0.164	3.65	- 5.79	14613	0.290
69m	8.50	0.144	1.29	- 5.90	14763	0.290
j	7.89	0.147	- 9.69	2.38	16092	0.314
s	6.94	0.151	- 1.44	- 1.99	17681	0.342
d	7.68	0.141	3.52	- 6.03	17937	0.344
70m	7.48	0.134	-11.50	8.58	19359	0.367
j	5.97	0.164	- 7.37	9.45	19693	0.371
s	6.61	0.165	6.66	- 0.61	18301	0.342
d	6.84	0.162	- 2.05	6.48	18592	0.345
71m	6.33	0.166	- 0.95	6.99	18181	0.336
j	6.72	0.168	0.89	7.98	16879	0.310
s	6.45	0.216	0.31	10.88	15393	0.232
d	6.76	0.235	12.72	0.00	14466	0.266
72m	8.16	0.216	8.21	- 0.69	12373	0.227
j	8.10	0.232	4.69	3.45	13189	0.240
s	8.91	0.232	4.26	- 3.23	14997	0.272
d	8.85	0.217	- 2.71	- 9.45	16852	0.302
73m	8.42	0.191	- 5.23	- 4.97	19407	0.346
j	7.98	0.198	- 1.25	- 1.52	22888	0.407
s	8.22	0.185	- 5.96	4.32	25791	0.453
d	7.00	0.214	-17.43	13.55	23542	0.410

Quarter	(54) V _n	(55) I _v	(56) D _v	(57) i _v	(58) d _v
64m	12183	0.273	3.18	10.26	5.66
j	13487	0.301	3.36	3.49	8.93
s	13240	0.294	3.78	- 3.40	7.80
d	12736	0.281	3.95	- 3.20	5.82
65m	12641	0.276	4.24	- 3.26	8.96
j	12134	0.263	4.71	- 1.90	1.70
s	12346	0.266	4.40	- 1.32	- 5.57
d	11977	0.256	4.22	- 5.66	- 3.67
66m	11148	0.237	4.09	- 3.59	- 5.50
j	11352	0.239	3.77	1.67	- 6.10
s	11713	0.245	3.63	1.84	- 1.32
d	11913	0.246	3.67	- 2.62	- 0.14
67m	11202	0.232	3.62	- 0.65	- 4.97
j	11905	0.245	3.31	1.02	- 8.16
s	11584	0.237	3.08	0.84	- 7.47
d	12287	0.249	2.85	1.00	- 0.35
68m	12011	0.242	3.06	0.21	1.14
j	12478	0.250	2.92	4.20	- 3.60
s	13205	0.263	2.85	0.19	0.53
d	12667	0.251	2.95	- 0.20	0.17
69m	13358	0.262	2.86	2.29	3.57
j	13463	0.263	3.16	3.23	6.96
s	14392	0.279	3.30	1.25	4.85
d	14074	0.270	3.48	0.00	5.17
70m	14695	0.279	3.66	0.00	3.55
j	24375	0.270	3.74	- 3.70	- 2.01
s	13830	0.259	3.51	0.58	- 6.27
d	14713	0.273	3.30	1.10	- 3.94
71m	14342	0.265	3.25	- 6.23	- 2.00
j	13069	0.240	3.17	- 4.17	- 5.52
s	13271	0.245	2.90	3.27	- 9.48
d	13959	0.256	2.62	3.71	-13.36
72m	14440	0.264	2.20	5.30	-13.86
j	15590	0.284	2.01	3.17	- 2.74
s	15574	0.282	2.09	2.48	0.00
d	16628	0.298	2.01	10.40	10.20
73m	15290	0.344	2.50	8.72	22.40
j	20114	0.358	3.13	0.28	22.24
s	19699	0.346	3.93	- 6.79	10.05
d	17846	0.311	3.92	-11.25	- 0.26

Appendix 4.2.1Unemployment and Unfilled Vacancies -
Sectors of the Labour Force.

U_i : unemployment in sector i
 V_i : unfilled vacancies in sector i

(1) Occupations

opc : professional and semi-professional, clerical
and administrative
 obc : skilled building and construction
 ome : skilled metal and electrical
 oos : other skilled not included elsewhere (includes
skilled workers in mining and in the stone, glass,
chemicals, leather, rubber, clothing, textiles,
footwear, food, drink, tobacco, wood, furnishing,
paper and printing trades),
plus semi-skilled
 oum : unskilled manual
 oso : service occupations (includes hairdressers, priv-
ate domestics, hotel and guest-house workers, care-
takers and cleaners, and protective service occup-
ations).
 oru : rural occupations

(2) Age-Sex Sectors

dam : adult males (over 21 years of age)
 djm : junior males
 daf : adult females
 djf : junior females

(3) Geographical Sectors

gsy : Sydney metropolitan area
 gns : non-metropolitan New South Wales
 gmn : Melbourne metropolitan area
 gvc : non-metropolitan Victoria
 gbr : Brisbane metropolitan area
 gqu : non-metropolitan Queensland

gwa : Western Australia
gsa : South Australia
gts : Tasmania

(4) Industries

ipr : primary production, mining and quarrying
img : manufacturing
ibc : building and construction
ico : commerce, finance and property, transport and
communication
ipa : public administration, health and education
ios : other services (includes general professional,
entertainment, sport and recreation, hotels, guest
houses, restaurants, private domestic service, and
miscellaneous).

Quarter	(1) U _{opc}	(2) V _{opc}	(3) U _{obc}	(4) V _{obc}	(5) U _{ome}	(6) V _{ome}
64m	17651	7762	1207	2017	1957	7734
j	17217	9201	1027	2297	1615	9550
s	15053	10052	934	2270	1342	10581
d	12371	11346	852	2335	1577	10818
65m	13746	11427	787	2467	1301	11087
j	14225	12755	863	2446	1177	11899
s	13648	14130	992	2230	1270	11637
d	13940	14593	1230	2005	1949	10461
66m	15631	13274	1522	1810	2100	10131
j	12110	12759	1787	1612	2199	9479
s	16900	13785	2128	1652	2536	9613
d	15762	14545	1769	1550	2481	8703
67m	17391	12387	2179	1471	2612	7782
j	19574	12401	2295	1456	2854	7630
s	19187	9984	2075	1474	2824	7164
d	18332	8874	1612	1541	2749	6877
68m	19613	9797	1727	1634	2826	7164
j	20791	9216	1870	1586	2904	7010
s	19017	10008	1714	1683	2833	6667
d	17883	10198	1710	1558	2974	5802
69m	18278	10395	1701	1590	3101	5556
j	18021	12791	1646	1649	2979	5619
s	16652	13552	1489	1605	2773	6198
d	10372	13929	1735	1582	3240	6582
70m	16590	16998	1586	1719	2910	7005
j	16381	16671	1779	1367	2649	6739
s	17307	15326	1859	1296	3152	6957
d	10707	14901	2073	1426	3540	6957
71m	18874	15205	2230	1226	3493	7750
j	20256	12438	2250	1189	3570	6951
s	21573	11432	2521	1137	4339	6147
d	26860	12314	2908	1104	5161	5102
72m	27250	10186	3113	1063	6078	3882
j	30486	8635	2965	1319	7727	3308
s	32216	9229	3104	1349	5085	3002
d	32376	8976	3626	1584	4451	4447
73m	27092	11340	2675	1914	5217	5273
j	28691	14901	2120	2148	5103	6965
s	28827	17925	1787	2405	3929	9164
d	24331	15580	2286	2289	3361	9270

Quarter	(7) U _{ocs}	(8) V _{ocs}	(9) U _{oum}	(10) V _{oum}	(11) U _{oso}	(12) V _{oso}
64m	16743	11649	8950	2736	10754	3815
j	14488	13451	7462	3802	9507	3773
s	12465	15239	6759	4580	8653	4055
d	12584	17505	6372	4830	7831	4395
65m	11661	17300	6507	4459	7557	4362
j	11346	17256	6558	5157	7352	4413
s	12142	15229	6840	5046	7554	4126
d	14389	14549	8281	4661	7729	4036
66m	16980	12871	9804	2365	8318	3759
j	17683	11618	10263	2182	8859	3443
s	19135	11123	11148	1821	9252	3599
d	18607	12158	11433	1978	9177	3722
67m	18893	11967	11273	1920	9373	3702
j	20104	11592	11898	1836	10017	3275
s	20666	11446	12159	1513	10400	3454
d	18266	11507	11392	1828	10093	3455
68m	19226	11709	12163	2182	10135	3284
j	19143	11860	12536	2166	10242	3214
s	17421	12833	11227	2207	9815	3529
d	17339	12897	10929	2130	9179	3774
69m	16983	13442	10618	2174	8977	3494
j	16007	14852	10264	2328	8491	3910
s	13851	17204	9120	3438	7722	4258
d	14750	17421	8964	3770	7782	4489
70m	13637	18615	8810	3748	7537	4549
j	13606	17769	9157	3996	7096	5356
s	15354	15694	10618	3424	7254	5095
d	15345	15172	10982	3313	7520	5094
71m	17096	14430	12016	2645	7808	5167
j	18744	12686	13337	2071	8164	4642
s	20503	12601	14737	1921	8463	4426
d	23489	11099	17329	1680	9533	3854
72m	26656	10158	19388	1829	10362	3885
j	28038	10575	20013	1861	11276	4128
s	30344	11387	22846	2052	11960	4041
d	26795	11889	21996	1969	12577	4296
73m	21606	17321	18270	4849	11496	5331
j	19939	23394	17139	5440	10684	6690
s	17586	31276	16472	6259	10501	7293
d	18053	28393	16714	6598	10375	7136

Quarter	(25) U gns	(26) V gns	(27) U gmn	(28) V gmn	(29) U gvo	(30) V gvo
64m	13190	3708	7382	10643	4231	2948
j	11794	4690	6863	13562	3987	4118
s	10108	4895	5506	16204	3684	4417
d	8010	5030	5165	18137	3237	4386
65m	8648	5140	5250	16702	3640	3500
j	8963	5289	5451	18162	3556	4720
s	9598	4752	5992	17315	3752	4560
d	9859	4343	6843	16680	4065	4097
66m	11002	3483	8088	14285	4520	3251
j	11428	3327	8932	14320	4888	3515
s	11840	3607	10163	15128	5174	3520
d	10815	3954	9338	16518	4854	3657
67m	11071	4036	9510	13421	5260	2844
j	12006	5290	10688	12926	5178	2918
s	11707	3933	11669	10890	5809	2663
d	10426	3770	11270	10396	6327	2429
68m	11004	4139	11599	10198	7013	2258
j	11118	4058	12880	9696	7834	2226
s	10895	4350	11350	10563	6838	2315
d	10381	3943	10416	10188	6860	2052
69m	10264	4231	9779	11249	6318	2176
j	10197	3557	8888	12250	5766	2365
s	9518	4170	7834	13998	5711	2243
d	10770	4710	8826	13752	5538	2608
70m	9931	4455	7867	15371	5358	3156
j	10297	4272	7608	14521	5492	2580
s	11019	4458	8623	12854	5745	2392
d	12186	4556	9318	13469	6604	2216
71m	12245	4484	10173	12784	6541	2296
j	12609	3578	10819	10438	6383	1803
s	13492	3888	12425	9612	7537	1718
d	16947	3732	15138	9055	8571	1724
72m	18248	3114	17227	9508	8632	2153
j	18370	3285	17494	9049	8704	1958
s	20038	3200	18186	9204	9828	1930
d	21979	3474	16890	8942	9820	2370
73m	19533	5015	14889	12776	9113	2957
j	18740	6109	12901	16426	9909	3150
s	19334	7953	10463	21413	9297	4032
d	19459	6825	11509	17571	9046	4005

Quarter	(31) U gbr	(32) V gbr	(33) U gqu	(34) V gqu	(35) U gwa	(36) V gwa
64m	3779	2633	6936	1815	5624	1342
j	3214	2900	5911	2136	5117	1542
s	2912	3004	5391	2387	5210	1570
d	3327	3253	5198	2553	4492	1707
65m	3104	2700	5612	2111	4239	2377
j	3183	2342	6301	1973	3365	2990
s	3173	2275	6332	1815	8963	3617
d	3124	2427	7467	1478	2815	3801
66m	4051	2207	7471	1437	3017	3759
j	4258	2141	7471	1444	2953	3794
s	4833	2069	7186	1386	3173	3224
d	4668	1870	7568	1353	3382	2847
67m	5026	1883	8076	1334	3402	2921
j	5863	1625	8327	1105	3551	3107
s	5864	1671	7532	1043	3254	3329
d	4623	1839	7692	1112	3413	3715
68m	4563	1862	8622	970	3765	3485
j	4425	1786	8037	1106	3761	3461
s	4160	1727	7303	1062	3988	3404
d	3927	1698	7813	1039	3937	3742
69m	3684	1592	7916	925	3979	4345
j	3607	1481	8098	773	4048	4667
s	3222	1734	7889	924	3531	5195
d	3446	1674	7920	1008	3902	5519
70m	2975	2367	7451	1200	3950	4818
j	2435	2539	6867	1178	4453	4175
s	3004	2404	7647	1060	4769	3806
d	3304	2336	7396	1086	4882	3875
71m	3410	2354	7487	1173	5483	3553
j	3596	2456	7346	1083	6170	2957
s	3514	2217	8442	1123	6878	2696
d	3637	2327	7710	1176	6987	2012
72m	4765	1881	7593	1275	9741	1743
j	4986	2015	7440	1414	11219	1889
s	4700	2316	9259	1414	13266	2037
d	4213	2255	8631	1337	11674	2551
73m	3301	3262	7708	1603	9328	3047
j	2809	4759	8524	2122	8371	3629
s	2999	5465	9641	2603	7085	4762
d	2291	5622	6571	2315	6793	5127

Quarter	(37) U _{gsa}	(38) V _{gsa}	(39) U _{gts}	(40) V _{gts}
64m	4650	3809	3157	875
j	4518	4377	3038	793
s	3995	4471	3378	777
d	4722	4804	2649	975
65m	3840	5048	2214	882
j	3496	5233	2275	935
s	3875	4625	2108	1206
d	4728	3802	1884	1382
66m	5937	2797	1909	1392
j	5246	2168	1730	1226
s	8017	2178	1839	1106
d	7615	2694	1893	1405
67m	7956	2158	2333	1767
j	8542	1814	2234	1711
s	8685	1884	2286	1967
d	7941	2220	2127	1914
68m	8165	2201	2124	1697
j	8607	2049	2198	1487
s	7898	2147	2067	1226
d	7331	2397	2599	1164
69m	7815	2369	2398	916
j	6921	2878	2355	981
s	5855	3287	2297	1220
d	6146	3340	2206	1046
70m	6316	3584	2521	1172
j	6353	3378	1940	1256
s	6654	3165	2005	1274
d	6675	3030	2119	1081
71m	7362	3130	2161	1004
j	8132	3177	2786	990
s	8277	3524	2906	913
d	9115	2577	3083	826
72m	10785	2807	3313	896
j	11639	2778	3770	1028
s	14183	2608	3849	936
d	13291	2731	4512	943
73m	10483	4302	3867	1280
j	9734	5933	3943	1278
s	9580	6835	3641	1411
d	9373	5656	3271	1360

Quarter	(41) V _{ipr}	(42) V _{img}	(43) V _{ibo}	(44) V _{ico}	(45) V _{ipa}	(46) V _{ios}
64m	1777	18324	4061	6129	2973	3523
j	2383	21485	5693	8220	3153	3461
s	2555	23888	5430	10392	3258	3794
d	2628	26991	5090	10512	3662	4134
65m	1959	26381	5472	10867	3670	3995
j	2294	26759	6732	12421	4093	4057
s	2320	24678	5602	13070	4224	3909
d	1817	24288	5026	12264	4875	3872
66m	1701	21062	3675	10734	4170	3653
j	1720	18935	4004	10478	3853	3362
s	1726	18119	3151	11892	5752	3487
d	1793	19795	2910	12639	3520	3747
67m	1651	18358	2771	10144	3374	3778
j	1841	17508	3237	10147	3444	3300
s	1957	16593	2780	7955	3094	3441
d	1799	17211	3112	7151	3041	3410
68m	1649	16954	3039	8517	3090	3325
j	1619	16807	3809	8211	2768	3252
s	1747	17876	3056	8644	2978	3461
d	1864	17232	2750	8787	2904	3655
69m	1830	17790	2873	8822	3181	3691
j	1614	19094	3602	10225	3981	3980
s	1791	21705	3431	11719	4369	4318
d	2005	21810	3432	12014	4913	4417
70m	2036	23942	3352	14860	5477	4742
j	1960	22892	3366	15158	5202	5277
s	1581	20550	2622	13320	5012	5051
d	1905	20216	2821	13360	4568	4850
71m	1992	19784	2420	13963	4336	4803
j	1506	17715	2395	10680	4474	4514
s	1587	16971	2164	9435	4168	4102
d	1453	14583	2180	10732	3553	3697
72m	1648	13143	2222	8172	3138	3806
j	1688	13274	2167	7079	2668	4093
s	1522	14234	2325	7351	2817	4039
d	1595	14567	2742	7619	2923	4300
73m	2563	21704	4047	10654	3722	5302
j	2993	29548	4999	14386	4118	6744
s	3151	39730	4986	17367	4354	7366
d	3388	34688	4630	19154	5130	6864

Appendix 4.2.2

Sectoral Shares of Unemployment (j_i) and of Unfilled Vacancies (k_i)

Sector Year	opc		obo		ome		oos	
	j_i	k_i	j_i	k_i	j_i	k_i	j_i	k_i
1964	0.305	0.216	0.020	0.049	0.033	0.212	0.278	0.315
1965	0.307	0.249	0.021	0.042	0.033	0.209	0.272	0.303
1966	0.252	0.314	0.029	0.038	0.038	0.216	0.300	0.274
1967	0.276	0.285	0.030	0.040	0.041	0.195	0.291	0.311
1968	0.290	0.266	0.026	0.043	0.043	0.178	0.276	0.333
1969	0.306	0.287	0.029	0.037	0.053	0.137	0.264	0.355
1970	0.311	0.312	0.032	0.029	0.056	0.134	0.256	0.330
1971	0.297	0.316	0.034	0.028	0.057	0.156	0.269	0.312
1972	0.292	0.286	0.031	0.042	0.059	0.116	0.268	0.339
1973	0.324	0.232	0.027	0.034	0.052	0.121	0.231	0.389

Sector Year	oou		oso		oru	
	j_i	k_i	j_i	k_i	j_i	k_i
1964	0.155	0.086	0.181	0.088	0.038	0.036
1965	0.155	0.090	0.167	0.079	0.045	0.027
1966	0.177	0.048	0.148	0.083	0.037	0.027
1967	0.175	0.047	0.149	0.093	0.039	0.028
1968	0.177	0.059	0.148	0.093	0.038	0.029
1969	0.167	0.065	0.141	0.091	0.040	0.027
1970	0.175	0.071	0.131	0.100	0.040	0.024
1971	0.194	0.052	0.115	0.111	0.035	0.028
1972	0.202	0.059	0.111	0.126	0.028	0.034
1973	0.204	0.090	0.128	0.103	0.034	0.030

Sector Year	dam		djm		daf		djf	
	j_i	k_i	j_i	k_i	j_i	k_i	j_i	k_i
1964	0.388	0.517	0.142	0.204	0.218	0.170	0.251	0.108
1965	0.389	0.475	0.151	0.235	0.218	0.167	0.242	0.123
1966	0.444	0.409	0.163	0.263	0.187	0.183	0.206	0.145
1967	0.449	0.431	0.164	0.223	0.185	0.211	0.202	0.135
1968	0.432	0.446	0.170	0.195	0.190	0.215	0.206	0.143
1969	0.414	0.424	0.191	0.180	0.188	0.241	0.207	0.155
1970	0.403	0.403	0.213	0.179	0.182	0.252	0.203	0.165
1971	0.429	0.397	0.226	0.165	0.162	0.261	0.183	0.178
1972	0.451	0.408	0.229	0.139	0.144	0.279	0.176	0.174
1973	0.415	0.495	0.219	0.128	0.153	0.257	0.213	0.121

Sector Year	gsy		gns		gmn		gvc	
	j_i	k_i	j_i	k_i	j_i	k_i	j_i	k_i
1964	0.161	0.237	0.211	0.100	0.123	0.320	0.074	0.083
1965	0.152	0.266	0.204	0.091	0.129	0.321	0.083	0.076
1966	0.186	0.247	0.187	0.083	0.150	0.347	0.080	0.079
1967	0.182	0.239	0.168	0.112	0.160	0.316	0.084	0.072
1968	0.157	0.287	0.163	0.111	0.174	0.274	0.107	0.060
1969	0.157	0.302	0.174	0.095	0.152	0.289	0.100	0.053
1970	0.145	0.343	0.193	0.087	0.148	0.277	0.103	0.053
1971	0.150	0.307	0.189	0.096	0.164	0.257	0.100	0.048
1972	0.162	0.263	0.189	0.101	0.168	0.283	0.089	0.066
1973	0.126	0.300	0.229	0.101	0.150	0.263	0.111	0.054

Sector Year	gbr		gou		gwa		gsa	
	j_i	k_i	j_i	k_i	j_i	k_i	j_i	k_i
1964	0.066	0.065	0.117	0.049	0.101	0.033	0.088	0.095
1965	0.071	0.045	0.140	0.034	0.075	0.059	0.088	0.086
1966	0.073	0.047	0.124	0.032	0.052	0.078	0.117	0.057
1967	0.079	0.047	0.119	0.031	0.051	0.087	0.124	0.054
1968	0.064	0.048	0.121	0.028	0.058	0.095	0.120	0.060
1969	0.060	0.037	0.136	0.021	0.066	0.111	0.115	0.067
1970	0.052	0.047	0.130	0.022	0.079	0.083	0.115	0.064
1971	0.043	0.057	0.104	0.028	0.092	0.069	0.111	0.075
1972	0.045	0.066	0.078	0.042	0.109	0.064	0.119	0.084
1973	0.034	0.075	0.094	0.034	0.095	0.064	0.117	0.088

Sector Year	gva		ipr	imr	ibc	ico	ipa	ios
	j_i	k_i	k_i	k_i	k_i	k_i	k_i	k_i
1964	0.060	0.019	0.049	0.496	0.109	0.194	0.071	0.082
1965	0.047	0.021	0.038	0.477	0.105	0.226	0.079	0.074
1966	0.031	0.030	0.040	0.448	0.078	0.265	0.088	0.082
1967	0.034	0.049	0.047	0.465	0.079	0.231	0.086	0.093
1968	0.034	0.037	0.046	0.465	0.084	0.232	0.079	0.079
1969	0.039	0.023	0.041	0.454	0.075	0.244	0.093	0.093
1970	0.038	0.023	0.038	0.430	0.059	0.276	0.099	0.097
1971	0.037	0.023	0.043	0.421	0.056	0.276	0.101	0.103
1972	0.037	0.029	0.050	0.426	0.077	0.234	0.089	0.126
1973	0.044	0.021	0.046	0.488	0.072	0.224	0.068	0.102

Appendix 4.3

Structure of the Labour Force and Unemployment

OCCUPATIONS

Sector Year	Sales	Clerical	Tradesmen Production Workers etc.	Service Sport Recreation	Other Occupations	No previous Work Experience	TOTAL
U _i	'000	'000	'000	'000	'000	'000	'000
1964	5.2	5.6	18.1	8.8	12.0	13.5	63.3
1965	6.4	4.6	18.9	7.9	11.7	11.4	60.7
1966	7.6	6.2	23.7	8.6	12.0	13.4	71.5
1967	9.2	6.8	26.0	9.9	13.4	13.9	79.1
1968	8.8	7.4	23.3	9.9	13.1	15.3	77.8
1969	10.0	7.8	24.2	10.6	13.4	14.1	80.0
1970	11.1	7.2	23.4	8.1	12.7	12.3	74.8
1971	12.0	8.0	29.0	10.2	15.4	13.0	87.6
1972	14.9	12.0	43.6	14.2	19.5	21.7	125.9
1973	14.4	10.9	33.1	13.4	17.5	18.4	107.7
U _i /U							
1964	0.082	0.088	0.286	0.139	0.190	0.213	0.998
1965	0.105	0.076	0.311	0.128	0.193	0.188	1.001
1966	0.106	0.087	0.331	0.120	0.168	0.187	0.999
1967	0.116	0.086	0.329	0.125	0.169	0.176	1.001
1968	0.113	0.095	0.299	0.127	0.168	0.197	0.999
1969	0.125	0.098	0.302	0.132	0.168	0.176	1.001
1970	0.118	0.096	0.313	0.108	0.170	0.165	1.000
1971	0.137	0.091	0.331	0.116	0.176	0.148	0.999
1972	0.118	0.095	0.346	0.113	0.155	0.172	0.999
1973	0.134	0.101	0.307	0.124	0.162	0.171	0.999
U _i /L _i	%	%	%	%	%	%	%
1964	0.83	1.52	1.11	2.40	0.77	..	1.39
1965	0.96	1.25	1.13	2.06	0.74	..	1.29
1966	1.07	1.59	1.39	2.19	0.74	..	1.48
1967	1.22	1.69	1.49	2.39	0.82	..	1.59
1968	1.13	1.78	1.31	2.33	0.79	..	1.53
1969	1.21	1.85	1.33	2.38	0.79	..	1.53
1970	1.26	1.62	1.26	1.77	0.72	..	1.38
1971	1.34	1.75	1.53	2.16	0.87	..	1.59
1972	1.66	2.46	2.28	2.93	1.08	..	2.24
1973	1.55	2.20	1.66	2.62	0.97	..	1.87

Sector Year	Sales	Clerical	Tradesmen, Production Workers, etc.	Service, Sport & Recreation	Other Occupations	No Prev- ious Ex- perience	TOTAL
L _i	'000	'000	'000	'000	'000	'000	'000
1964	623.2	368.8	1631.1	367.1	1555.2	13.5	4558.9
1965	666.7	367.4	1674.6	379.2	1589.4	11.4	4698.7
1966	710.0	390.4	1708.0	391.8	1618.6	13.4	4832.1
1967	752.4	402.7	1745.8	414.7	1627.7	13.9	4959.4
1968	781.0	416.5	1777.1	425.5	1663.8	15.3	5079.2
1969	829.8	421.8	1821.3	445.6	1698.3	14.1	5230.9
1970	882.5	444.6	1850.4	457.4	1756.6	12.3	5403.9
1971	897.0	456.5	1894.4	472.3	1778.8	13.0	5512.1
1972	897.5	488.2	1909.6	484.7	1813.0	21.7	5614.7
1973	929.0	495.5	1988.1	511.2	1805.6	18.4	5748.0
L _i /L							
1964	0.137	0.081	0.358	0.081	0.341	0.003	
1965	0.142	0.078	0.357	0.081	0.339	0.002	
1966	0.147	0.081	0.353	0.081	0.335	0.003	
1967	0.152	0.081	0.352	0.084	0.328	0.003	
1968	0.154	0.082	0.350	0.094	0.328	0.003	
1969	0.159	0.081	0.348	0.085	0.325	0.003	
1970	0.163	0.082	0.342	0.085	0.325	0.002	
1971	0.163	0.083	0.344	0.086	0.323	0.002	
1972	0.160	0.087	0.340	0.086	0.323	0.004	
1973	0.162	0.086	0.346	0.089	0.314	0.003	
u _i /u _{1f}							
1964	0.60	1.09	0.80	1.73	0.55		
1965	0.74	0.97	0.88	1.60	0.57		
1966	0.72	1.07	0.94	1.48	0.50		
1967	0.77	1.06	0.94	1.50	0.52		
1968	0.74	1.16	0.86	1.52	0.52		
1969	0.79	1.21	0.87	1.56	0.52		
1970	0.91	1.17	0.91	1.28	0.52		
1971	0.84	1.10	0.96	1.36	0.55		
1972	0.74	1.10	1.02	1.31	0.48		
1973	0.83	1.18	0.89	1.40	0.52		

AGE - SEX SECTORS

Sector Year	MALES				FEMALES				TOTAL
	15-19 yrs	20-34 yrs	35 & over	Total	15-19 yrs	20-34 yrs	35 & over	Total	
U _i	'000	'000	'000	'000	'000	'000	'000	'000	'000
1964	9.3	8.0	12.2	29.4	14.8	10.3	8.8	33.9	63.3
1965	9.9	7.8	10.8	28.5	13.4	9.4	9.4	32.2	60.7
1966	10.4	10.7	14.8	35.9	15.6	10.8	9.3	35.6	71.5
1967	12.3	12.9	15.0	40.3	14.9	12.8	11.1	38.8	79.1
1968	12.0	12.5	12.6	37.2	15.0	14.5	11.2	40.6	77.8
1969	12.0	12.8	13.8	38.5	15.2	15.8	10.5	41.5	80.0
1970	12.4	11.6	12.5	36.4	13.2	14.2	10.9	38.3	74.8
1971	14.6	15.6	15.2	45.5	13.8	15.6	12.7	42.1	87.6
1972	21.3	24.7	22.4	68.5	20.4	23.2	13.8	57.4	125.9
1973	19.1	18.5	15.9	53.5	19.6	20.8	13.8	54.2	107.7
U _i /U									
1964	0.147	0.126	0.193	0.464	0.234	0.163	0.139	0.536	1.000
1965	0.163	0.129	0.178	0.470	0.221	0.155	0.155	0.530	1.000
1966	0.145	0.150	0.207	0.502	0.218	0.151	0.130	0.498	1.000
1967	0.155	0.163	0.190	0.508	0.188	0.162	0.140	0.491	1.000
1968	0.154	0.161	0.162	0.477	0.193	0.166	0.144	0.522	1.000
1969	0.150	0.160	0.172	0.481	0.190	0.198	0.131	0.519	1.000
1970	0.166	0.155	0.167	0.487	0.176	0.190	0.146	0.512	1.000
1971	0.167	0.178	0.174	0.519	0.158	0.178	0.145	0.481	1.000
1972	0.169	0.196	0.178	0.544	0.162	0.184	0.110	0.456	1.000
1973	0.177	0.172	0.148	0.497	0.182	0.193	0.128	0.503	1.000
U _i /L _i	%	%	%	%	%	%	%	%	%
1964	2.72	2.75	0.66	0.90	4.49	2.48	1.53	2.61	1.39
1965	2.86	0.72	0.57	0.86	4.22	2.09	1.56	2.35	1.29
1966	2.95	0.96	0.77	1.06	4.73	2.26	1.46	2.47	1.48
1967	3.60	1.12	0.77	1.17	4.61	2.44	1.66	2.56	1.59
1968	3.65	1.04	0.64	1.06	4.76	2.59	1.60	2.58	1.53
1969	3.56	1.01	0.69	1.07	4.87	2.61	1.45	2.53	1.53
1970	3.65	0.88	0.62	0.99	4.18	2.15	1.43	2.21	1.38
1971	4.36	1.14	0.75	1.22	4.43	2.33	1.57	2.35	1.59
1972	6.37	1.76	1.10	1.81	6.57	3.36	1.66	3.13	2.24
1973	5.46	0.78	0.78	1.40	6.20	2.82	1.60	2.83	1.87

Sector Year	MALES				FEMALES				TOTAL
	15-19 yrs	20-34 yrs	35 & Over	Total	15-19 yrs	20-34 yrs	35 & Over	Total	
L _i	'000	'000	'000	'000	'000	'000	'000	'000	'000
1964	341.7	1060.9	1855.3	3257.9	308.7	415.8	576.5	1301.0	4558.9
1965	346.0	1082.8	1890.1	3318.9	317.8	448.9	603.0	1369.8	4688.7
1966	352.8	1109.4	1927.4	3389.6	329.8	478.4	635.2	1442.6	4832.2
1967	341.6	1152.4	1950.1	3444.3	323.2	523.8	668.3	1515.3	4959.4
1968	329.2	1206.0	1971.2	3506.2	314.9	559.6	698.4	1573.0	5079.2
1969	337.0	1261.1	1991.1	3589.2	312.4	604.9	724.4	1641.7	5230.9
1970	339.3	1317.3	2012.1	3668.7	315.7	659.1	760.4	1735.2	5403.9
1971	335.1	1365.0	2023.3	3723.4	311.6	668.9	808.3	1790.2	5512.1
1972	334.6	1404.8	2042.9	3782.2	310.6	690.2	831.6	1832.4	5614.7
1973	349.9	1442.2	2033.1	3830.2	316.2	737.2	864.1	1917.8	5748.0
L _i /L									
1964	0.075	0.233	0.407	0.715	0.068	0.091	0.126	0.285	1.000
1965	0.074	0.231	0.403	0.708	0.068	0.096	0.129	0.292	1.000
1966	0.073	0.230	0.399	0.701	0.063	0.099	0.131	0.299	1.000
1967	0.069	0.232	0.393	0.694	0.065	0.106	0.135	0.306	1.000
1968	0.065	0.237	0.388	0.690	0.062	0.110	0.138	0.310	1.000
1969	0.064	0.241	0.381	0.686	0.060	0.116	0.138	0.314	1.000
1970	0.063	0.244	0.372	0.679	0.058	0.122	0.141	0.321	1.000
1971	0.061	0.248	0.367	0.675	0.057	0.121	0.147	0.325	1.000
1972	0.060	0.250	0.364	0.674	0.055	0.123	0.148	0.326	1.000
1973	0.061	0.251	0.355	0.666	0.055	0.128	0.150	0.334	1.000
U _i /U _{1f}									
1964	1.96	0.54	0.47	0.65	3.45	1.78	1.10	1.88	1.000
1965	2.22	0.56	0.44	0.67	3.27	1.62	1.21	1.82	1.000
1966	1.99	0.65	0.52	0.72	3.20	1.53	0.99	1.67	1.000
1967	2.26	0.70	0.48	0.74	2.90	1.53	1.04	1.61	1.000
1968	2.39	0.68	0.43	0.69	3.11	1.69	1.05	1.69	1.000
1969	2.33	0.66	0.45	0.70	3.18	1.71	0.95	1.65	1.000
1970	2.64	0.64	0.45	0.72	3.03	1.56	1.04	1.60	1.000
1971	2.74	0.72	0.47	0.77	2.79	1.47	0.99	1.48	1.000
1972	2.84	0.79	0.49	0.81	2.93	1.50	0.74	1.40	1.000
1973	2.92	0.68	0.42	0.75	3.32	1.51	0.86	1.51	1.000

GEOGRAPHICAL REGIONS

STATE	N.S.W.	VIC.	Qu.	S.A.	W.A.	TAS.	AUST.
u_i	%	%	%	%	%	%	
1964	1.1	0.8	1.5	1.1	1.7	2.2	1.1
1965	1.0	0.7	1.6	0.9	1.1	1.5	1.0
1966	1.3	1.0	1.9	1.6	1.0	1.3	1.4
1967	1.3	1.2	2.0	1.8	1.1	1.6	1.4
1968	1.1	1.3	1.8	1.6	1.1	1.5	1.3
1969	1.0	1.0	1.6	1.3	1.0	1.6	1.1
1970	0.9	1.0	1.4	1.3	1.1	1.4	1.0
1971	1.2	1.3	1.5	1.6	1.6	1.7	1.3
1972	1.8	1.8	1.7	2.3	2.6	2.5	1.8
1973	1.4	1.5	1.8	1.8	1.8	2.4	1.5
u_i/u							
1964	1.00	0.73	1.36	1.00	1.55	2.00	
1965	1.00	0.73	1.60	0.90	1.10	1.50	
1966	0.93	0.71	1.36	1.14	0.71	0.93	
1967	0.93	0.86	1.43	1.29	0.79	1.14	
1968	0.85	1.00	1.38	1.23	0.85	1.15	
1969	0.91	0.91	1.45	1.18	0.91	1.45	
1970	0.90	1.00	1.40	1.30	1.10	1.40	
1971	0.92	1.00	1.15	1.23	1.23	1.31	
1972	1.00	1.00	0.94	1.28	1.44	1.39	
1973	0.93	1.00	0.93	1.20	1.20	1.60	

Sector Year	STATE CAPITAL CITIES			OTHER AREAS		
	Males	Females	Persons	Males	Females	Persons
u_i	%	%	%	%	%	%
1964	0.9	1.9	1.2	1.1	4.6	2.0
1965	0.9	1.9	1.2	1.0	3.8	1.7
1966	0.9	2.1	1.5	1.2	3.6	1.7
1967	1.2	2.0	1.5	1.1	3.7	1.8
1968	1.1	2.0	1.4	1.0	3.7	1.7
1969	1.0	2.1	1.4	1.2	3.5	1.8
1970	1.0	2.0	1.2	1.1	3.2	1.6
1971	1.2	2.0	1.5	1.2	3.0	1.7
1972	2.0	2.8	2.3	1.5	3.8	2.2
1973	1.4	2.5	1.8	1.5	3.6	2.1
u_i/u_{lf}						
1964	0.64	1.36	0.86	0.79	3.29	1.43
1965	0.69	1.46	0.92	0.77	2.92	1.31
1966	0.60	1.40	1.00	0.80	2.40	1.13
1967	0.75	1.25	0.94	0.69	2.31	1.12
1968	0.73	1.33	0.93	0.67	2.47	1.13
1969	0.67	1.40	0.93	0.80	2.33	1.20
1970	0.71	1.43	0.86	0.79	2.29	1.14
1971	0.75	1.25	0.94	0.75	1.88	1.06
1972	0.91	1.27	1.05	0.68	1.73	1.00
1973	0.74	1.32	0.95	0.79	1.89	1.11

INDUSTRIES

Sector Year	Manufac- turing	Building and Construc- tion	Commerce	Community & Business Services	Amusement, Hotels & Personal Services	Other Industries
U _i	'000	'000	'000	'000	'000	'000
1964	14.3	3.5	9.1	4.7	7.9	10.2
1965	14.4	3.7	9.4	4.6	7.0	10.2
1966	17.4	5.4	11.0	5.3	7.5	11.6
1967	18.8	6.8	12.4	6.9	8.1	12.1
1968	18.5	4.8	12.2	6.2	8.5	12.3
1969	18.3	5.5	13.4	6.7	8.7	12.9
1970	16.2	6.7	13.9	6.6	7.6	11.4
1971	21.4	7.6	14.6	7.6	8.6	14.8
1972 ¹						
1973 ¹						
U _i /U						
1964	0.226	0.055	0.144	0.074	0.125	0.161
1965	0.237	0.061	0.155	0.076	0.115	0.168
1966	0.243	0.076	0.154	0.074	0.105	0.162
1967	0.238	0.086	0.157	0.087	0.102	0.153
1968	0.238	0.062	0.157	0.080	0.109	0.158
1969	0.235	0.069	0.168	0.084	0.109	0.161
1970	0.217	0.090	0.186	0.088	0.102	0.153
1971	0.244	0.087	0.167	0.087	0.098	0.169
1972						
1973						
U _i /L _i	%	%	%	%	%	%
1964	1.12	0.90	1.12	0.96	2.38	0.80
1965	1.10	0.93	1.13	0.89	2.24	0.78
1966	1.31	1.30	1.27	0.95	2.36	0.86
1967	1.38	1.65	1.42	1.17	2.39	0.88
1968	1.36	1.12	1.36	1.00	2.50	0.87
1969	1.36	1.22	1.47	1.02	2.50	0.88
1970	1.14	1.43	1.48	0.95	2.11	0.76
1971	1.47	1.60	1.50	1.04	2.35	0.98
1972						
1973						

Sector Year	Manufac- turing	Building and Construc- tion	Commerce	Community & Business Services	Amusement, Hotels & Personal Services	Other Industries
L _i	'000	'000	'000	'000	'000	'000
1964	1274.7	391.0	812.2	492.0	305.7	1262.8
1965	1312.6	397.4	835.0	517.6	312.7	1302.0
1966	1324.0	414.1	866.7	555.2	317.4	1341.3
1967	1358.4	413.2	875.8	587.4	338.9	1371.8
1968	1361.0	430.0	899.1	620.0	340.3	1413.5
1969	1385.8	452.3	909.9	657.6	348.1	1463.6
1970	1417.8	468.7	938.2	697.2	360.0	1509.8
1971	1458.8	475.4	971.8	730.5	366.0	1508.7
1972						
1973						
L _i /L						
1964	0.280	0.086	0.178	0.108	0.067	0.279
1965	0.280	0.085	0.178	0.110	0.067	0.278
1966	0.274	0.086	0.179	0.115	0.066	0.278
1967	0.274	0.083	0.177	0.118	0.068	0.277
1968	0.268	0.085	0.177	0.122	0.067	0.278
1969	0.265	0.086	0.174	0.126	0.067	0.280
1970	0.262	0.087	0.174	0.129	0.067	0.279
1971	0.265	0.086	0.176	0.133	0.066	0.274
1972						
1973						
U _i /U _{1f}						
1964	0.81	0.65	0.81	0.69	1.86	0.58
1965	0.85	0.72	0.88	0.69	1.74	0.60
1966	0.89	0.88	0.86	0.64	1.59	0.58
1967	0.87	1.04	0.89	0.74	1.50	0.55
1968	0.89	0.73	0.89	0.65	1.63	0.57
1969	0.89	0.80	0.96	0.67	1.63	0.58
1970	0.83	1.04	1.07	0.69	1.53	0.55
1971	0.92	1.01	0.94	0.65	1.48	0.62
1972						
1973						

1. Industry classification changed in 1972

CHAPTER 5

AGGREGATE UNEMPLOYMENT - VACANCY RELATIONSHIP.

5.1 Introduction.

The primary objective of this chapter is to obtain empirical estimates of the aggregate u-v relationship and to use the estimated relationship as a basis for determining the level of non demand-deficient unemployment. Section 2 presents time series data on unemployment and unfilled vacancies and section 3 graphs of the u-v relationship. In section 4 estimates of the basic form of the u-v relationship, both linear and logarithmically linear, are presented and evaluated. Section 5 attempts to improve the fit of the u-v relationship through the inclusion of the rate of change of either u or v as an independent variable. The graphs presented in section 3 suggest that changes in the position of the aggregate u-v relationship have taken place. Section 6 tests for shifts in both the intercept and slope of the relationship through the introduction of dummy variables. Dummy variables for alternative periods are tested to ascertain both the timing and the nature of shifts in the u-v relationship. Section 7 tests the possibility that the u-v curve has been shifting steadily through time. On the basis of the results of sections 6 and 7 sub-periods can be identified for which the u-v relationship was stable. Section 8 presents estimates of the basic form of the u-v relationship, linear and log-linear, for each of these sub-periods. The estimates of the statement ratio in section 4.4.3 are combined with the results of section 8 to obtain estimates of non demand-deficient unemployment and these are shown in section 9. In section

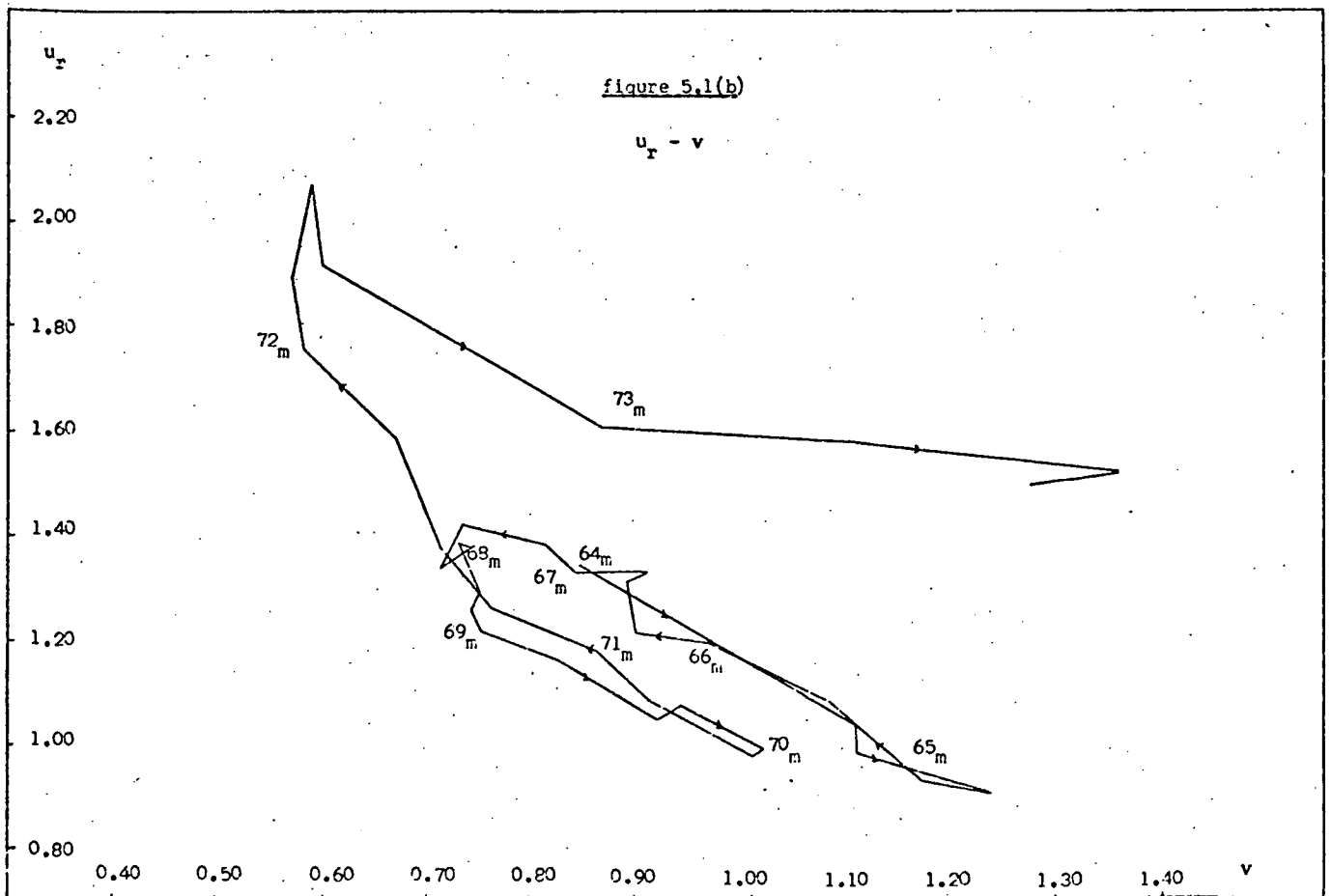
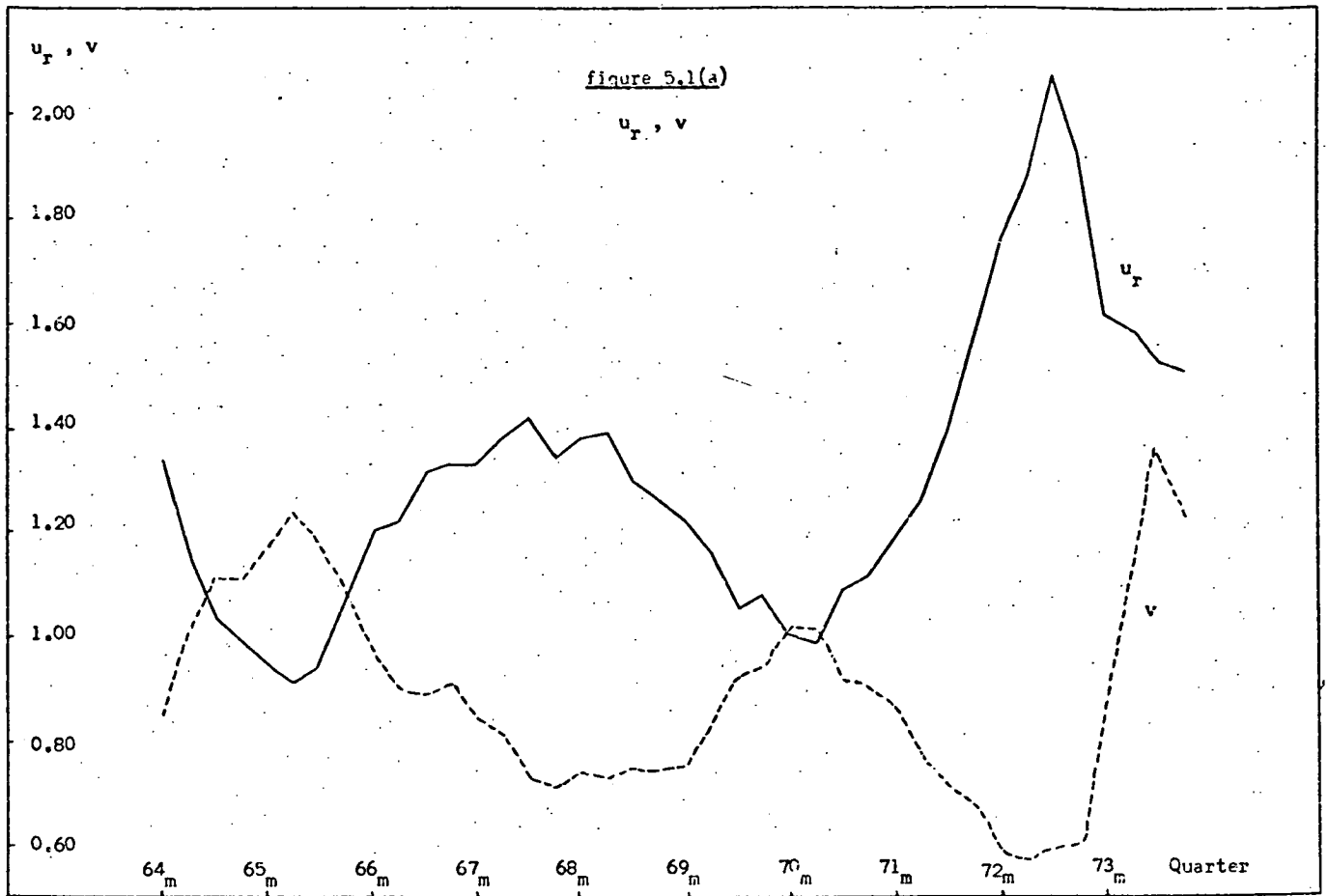
10 series on demand-deficient unemployment are derived from data on u and non demand-deficient unemployment.

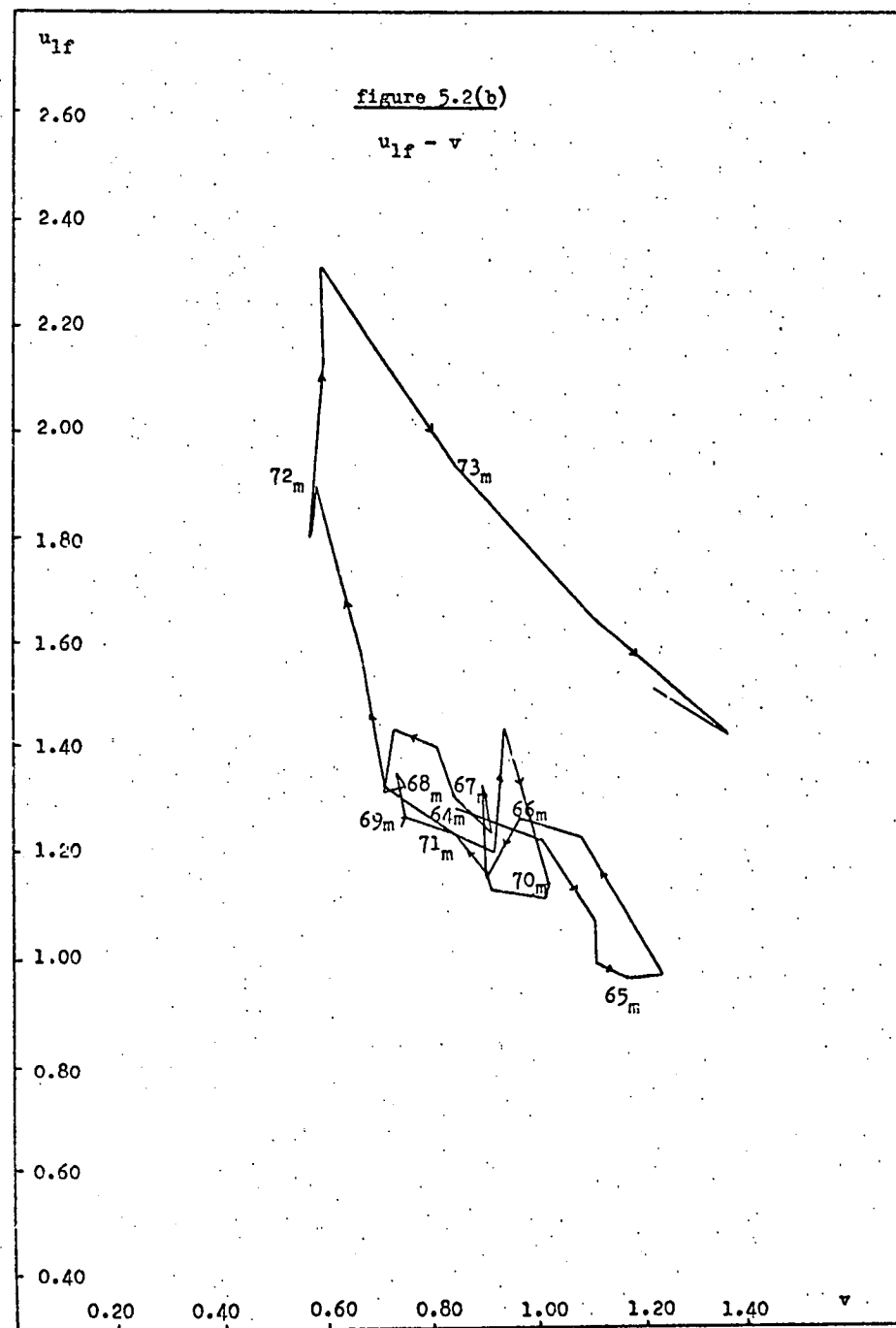
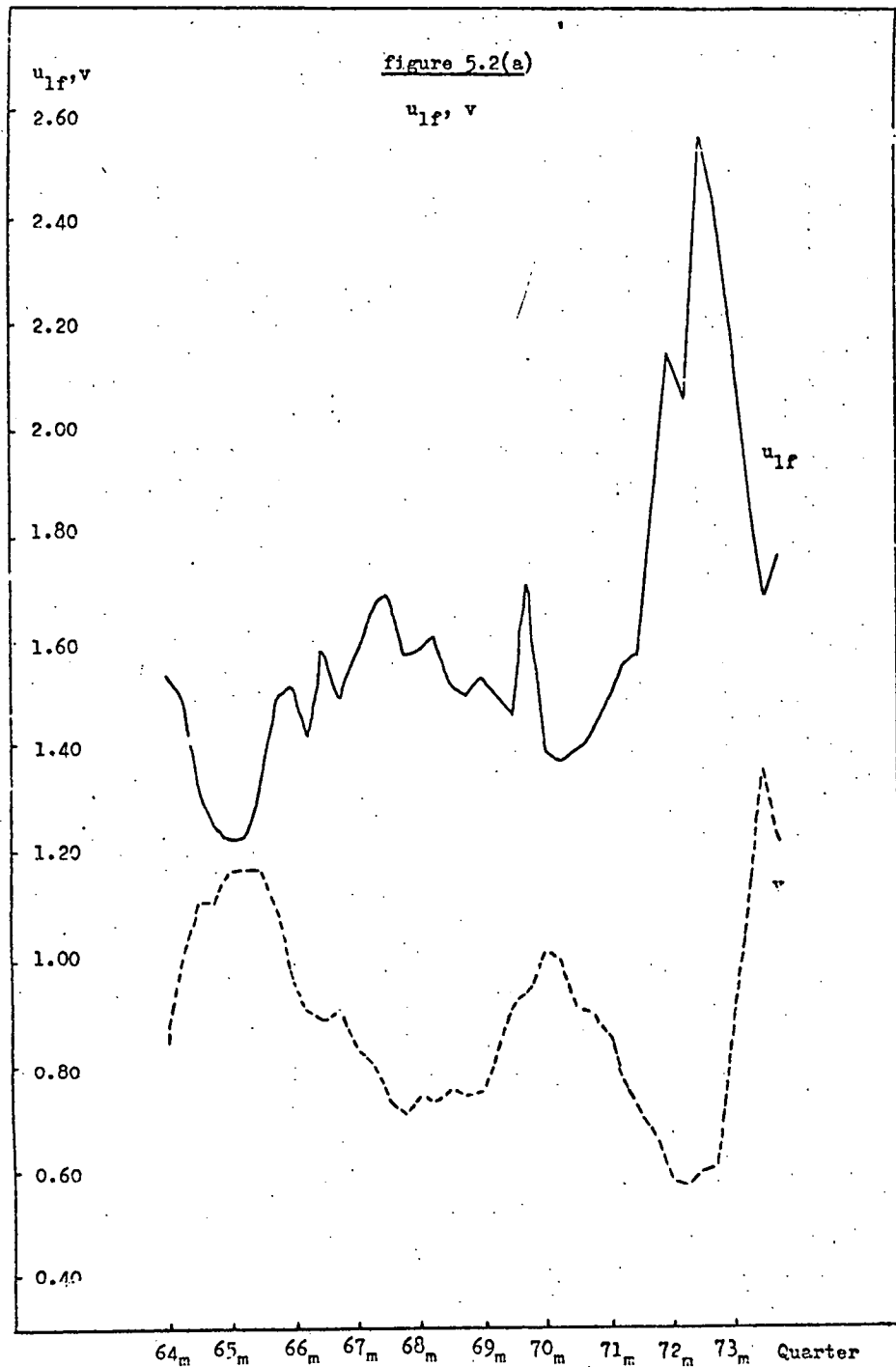
The equations in this chapter, and in chapters 6 and 7, were estimated by the method of single equation least squares (SELS). Estimated equations are presented for both linear and non-linear forms of the testing equations. With respect to the non-linear equations, the variables were transformed into their logarithms for testing purposes and the results are also presented in terms of logarithms. The logarithm of a variable, say x , will be denoted by \bar{x} .

Test statistics are included with the estimated regression equations for the purpose of evaluation of the results. We are particularly concerned with the relative performance of the various forms of the relationship tested and with the significance of the dummy variables. The test statistics included with each estimated equation are \bar{R}^2 , the t -ratio for each coefficient and the Durbin-Watson statistic (D.W.S.). Since lagged dependent variables are not included as explanatory variables in the estimated relationships, the Durbin-Watson test for the presence of first order serial correlation in the residuals is appropriate. The primary test statistic to be used in choosing between equations is \bar{R}^2 ; the secondary test statistics are the t -ratios of the estimated coefficients, particularly the t -ratio associated with the coefficient on v . Testing the significance of coefficients will be based on a 5 per cent level of significance. The tertiary test of a relationship is that of a satisfactory D.W.S. at the 1 per cent level of significance.

5.2 Data Series.

Figures 5.1(a) and 5.2(a) present data on unemployment and unfilled vacancies for the period 1964-73. Figure 5.1(a) graphs time





series data on u_r and v ; figure 5.2(a) graphs time series data on u_{lf} and v . In comparing series on unemployment and unfilled vacancies the following aspects require consideration :

- (1) Changes in the unemployment series relative to changes in the unfilled vacancies series (particularly cyclical and secular movements.)
- (2) Cyclical turning points in the respective series. Comparing turning points will give an indication as to the presence of lags in the $u-v$ relationship.
- (3) Points of intersection between the unemployment and unfilled vacancies series. Changes in the level of u and v at which this intersection takes place over time will reflect changes in the level of non demand-deficient unemployment. Differences in the point of intersection as between periods of increasing and decreasing demand will indicate the possibility of "loops" in the $u-v$ relationship.

Figure 5.1(a) suggests "inverse parallelism" between u_r and v : movements in one series are reflected by movements in the other series, in the opposite direction. The inverse parallelism pattern breaks down to a certain extent in 1972, a period of low demand for labour, since the v series approached its lower limit at that time. Inverse parallelism is also evident as between u_{lf} and v , although the pattern is not as consistent as for u_r and v . The u_{lf} series appears to be subject to more irregular movements than the u_r series. The value of u_{lf} for 1969_d in particular appears to be inconsistent with observations on u_{lf} for quarters before and after 1969_d. The quarter will not be regarded as a turning point in the series.

The turning points for the v series were 65_j, 67_s, 70_j and 72_s. The cyclical turning points for both the u_r series (65_j, 67_s, 70_j, 72_s) and the u_{lf} series (65_m, 67_s, 70_j, 72_s) are similar. This indicates that lags are not involved in the $u-v$ relationship.

Figure 5.1(a) suggests a secular decline in the v series up to 1973. The u_r series appears to have been stable over time before 1972,

but in 1973 the series appeared to be levelling out at an higher level than previously. A tendency towards a secular increase is evident in the u_{1f} series. The value of u_{1f} was reasonably stable for the period 1966-69.

The u_r and v series intersected in both 1964-65 and 1969-70, the point of intersection being at a lower level of u_r and v in 1969-70 than in 1964-65. This suggests a reduction in the level of non demand-deficient unemployment. The series did not intersect in 1973, although the v series reached a higher level than at any time previously in the 1964-73 period. There is little difference in the level at which the two series intersect when unemployment is increasing compared with when it is decreasing. The u_{1f} and v series intersected only once in the 1964-73 period; there was a large gap between the two series in 1969-70, a period of high demand for labour.

5.3 Graphical Presentation.

Graphs of the u - v relationship for both u_r and u_{1f} are presented in figures 5.1(b) and 5.2(b). Figure 5.1(b) indicates that there is an inverse relationship between u_r and v , with non-linearity apparent when a sufficiently broad range of unemployment percentages is considered. The relationship approximates a linear form except for periods of low demand for labour. Although it is less apparent, figure 5.2(b) does suggest that there is an inverse relationship between u_{1f} and v . Non-linearity is again evident in the relationship. Figures 5.1(b) and 5.2(b) both indicate that "loops" in the u - v relationship are not significant.

The most significant feature of figure 5.1(b) is the evidence of changes in the position of the u_r - v relationship over time. The relationship shifted downwards and to the left as between 1967 and

1968, reflecting a reduction in the level of non demand-deficient unemployment. A more substantial shift of the relationship upwards and to the right occurred as from 1972. Dummy variables for the following quarters will be used to test for changes in the position of the u-v relationship :

D_1	:	1967 _j
D_2	:	1967 _s
D_3	:	1972 _m
D_4	:	1972 _j
D_5	:	1972 _s
D_6	:	1972 _d

Figure 5.2(b) suggests that no change in the relationship between u_{1f} and v took place in 1967. A substantial shift in the position of the u_{1f} - v relationship upwards and to the right is evident as from 1972, reflecting an increase in the level of non demand-deficient unemployment at that time.

The ensuing sections are concerned with statistically estimating the u-v relationship and testing for changes in the position thereof and, thus, for changes in the level of non demand-deficient unemployment. The level of non demand-deficient unemployment in the labour market directly affects the extent to which aggregate demand management policies can be used to reduce unemployment without causing conflict with other policy objectives. Were changes in the level of non demand-deficient unemployment to occur, policy actions taken in the past may no longer be appropriate.

5.4 Estimation of the u-v Relationship.

The first step of the empirical testing of the u-v relationship was to estimate linear regression equations of the basic form of the relationship (type A.1 equations) :

$$\text{i.e.} \quad u = a + b_1.v + e' \quad (\text{A.1})$$

Estimates of type A.1 equations for the period 1964-73 are presented in table 5.4.1 below for u_r and u_{lf} :

Table 5.4.1

Type A.1 Equations

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
A.1 a	$u_r = 2.045 - 0.830v$ (12.117) (4.483)	0.329	0.132
A.1 b	$u_{lf} = 2.352 - 0.830v$ (12.514) (4.026)	0.281	0.285

The t-statistics (in brackets under the coefficients) show that the coefficient on v is significant at the 5% level for both equations, supporting the previous observation that there is a relationship between u and v. The \bar{R}^2 is low with only 33 per cent of the variation in u_r and 28 per cent of that in u_{lf} being accounted for. The D.W.S. is also low for each of the equations indicating the presence of first order serial correlation in the residuals. The slope of the relationship is the same for both u_r and u_{lf} which means that u_r and u_{lf} are equally sensitive to changes in v. The difference between the relationships is that the u_{lf} -v relationship is further from the origin with an intercept term of 2.352 compared with 2.045 for u_r .

The next step in the testing of the aggregate u-v relationship was the estimation of type B.1 equations, the basic form of the non-linear equation :

$$\text{i.e.} \quad \log u = a' + b_1.\log v + e'' \quad (\text{B.1})$$

$$\text{i.e.} \quad \bar{u} = a' + b_1.\bar{v} + e''$$

The estimated type B.1 equations for each of u_r and u_{lf} are presented in table 5.4.2 below.

Table 5.4.2

Type B.1 Equations

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
B.1 a	$\bar{u}_r = 0.162 - 0.603\bar{v}$ (5.591) (5.390)	0.418	0.129
B.1 b	$\bar{u}_{lf} = 0.398 - 0.470\bar{v}$ (15.815) (4.838)	0.365	0.309

The coefficient on \bar{v} is significantly different from zero at the 5% level for both equations. The \bar{R}^2 for each of the equations is low with 42 per cent of the variation in \bar{u}_r and 36 per cent of the variation in \bar{u}_{lf} accounted for. The D.W.S. is low in both cases and it is apparent that not all the explanatory variables have been included in the relationship. The equations estimated above are presented in the form $u = a.v^b$ below :

$$\begin{array}{ll} \text{B.1 a} & : \quad u_r = 1.176v^{-0.603} \\ \text{B.1 b} & : \quad u_{lf} = 1.498v^{-0.470} \end{array}$$

The elasticity of u with respect to v is represented by the value of b . Unlike the slopes of the linear equations, the elasticity of u_{lf} with respect to v , in absolute terms, is substantially less than that for u_r .

The next section of this chapter tests the significance of rate of change variables in the u - v relationship. Since the logarithm of a negative number is undefined, rate of change variables are only tested for linear equations.

5.5 Significance of Rates of Change.

This section presents the results of testing type A.2 equations, that is, equations of the form :

$$\begin{aligned} u &= a + b_1.v + b_2.\dot{u}' + e' \\ u &= a + b_1.v + b_2.\dot{v}' + e' \end{aligned} \quad (\text{A.2})$$

Four rate of change variables were tested for both u_r and u_{lf} : the percentage rate of change in u (\dot{u}_r , \dot{u}_{lf}) ; the change in u in terms of percentage points (Δu_r , Δu_{lf}) ; the percentage rate of change in v (\dot{v}) ; and the change in v in terms of percentage points (Δv). The estimated equations are presented in table 5.5.1 below.

Table 5.5.1

Type A.2 Equations

Equation No.	E Q U A T I O N	\bar{R}^2 D.W.S.
A.2 a	$u_r = 2.060 - 0.846v - 0.003\dot{u}_r$ (11.989) (4.491) (0.627) ^r	0.318 0.141
A.2 b	$u_r = 2.060 - 0.846v - 0.246\Delta u_r$ (11.977) (4.487) (0.609) ^r	0.317 0.145
A.2 c	$u_r = 2.063 - 0.853v - 0.005\dot{v}$ (12.247) (4.612) (1.203)	0.336 0.180
A.2 d	$u_r = 2.051 - 0.843v + 0.670\Delta v$ (12.402) (4.646) (1.610)	0.356 0.194
A.2 e	$u_{lf} = 2.404 - 0.885v - 0.007\dot{u}_{lf}$ (12.360) (4.157) (1.024) ^{lf}	0.281 0.314
A.2 f	$u_{lf} = 2.424 - 0.908v - 0.468\Delta u_{lf}$ (12.395) (4.236) (1.231) ^{lf}	0.290 0.341
A.2 g	$u_{lf} = 2.382 - 0.868v + 0.008\dot{v}$ (12.973) (4.305) (1.777)	0.319 0.370
A.2 h	$u_{lf} = 2.361 - 0.850v + 0.998\Delta v$ (13.188) (4.326) (2.214)	0.348 0.410

The coefficient on the rate of change variable is not significantly different from zero for each of the forms of the rate of change variables tested in the u_r - v relationships. The inclusion of \dot{u}_r or Δu_r as an explanatory variable in the equation results in a slight reduction in the value of \bar{R}^2 and the addition of \dot{v} or Δv results in a very small increase in \bar{R}^2 . Similarly, there is some increase in the value of the D.W.S. There is insufficient improvement in the fit of the equation to indicate that the rate of change in u or v is a significant explanatory factor in the u_r - v relationship. The conclusion is that the position of the u_r - v relationship is not dependent on the direction and rate of change of u or v . That is, the u_r - v relationship is the same for when the demand for labour is increasing as it is when it is decreasing.

With respect to the u_{lf} - v equations, Δv is the only form of the rate of change variable for which the coefficient is significantly different from zero. The inclusion of \dot{u}_{lf} and Δu_{lf} as explanatory variables results in no significant increase in \bar{R}^2 and only a small improvement in the D.W.S. The inclusion of \dot{v} and Δv as independent variables in the u_{lf} - v relationship results in some improvement in both \bar{R}^2 and the D.W.S. The results as a whole suggest that the rate of change in u_{lf} or v is not a significant factor in the u_{lf} - v relationship. The probable reason for the significance of Δv is that the values that the variable takes on in 1972 and 1973 act as a proxy for the change in the u_{lf} - v relation which took place at that time. The subsequent inclusion of dummy variables in the u_{lf} - v equation to separately account for the shift in the relationship rendered the coefficient on Δv insignificant.

The general conclusion is that for both the u_r - v and the u_{lf} - v relationships the position of the relationship is not affected by the

rate of change of u or v . This means that the labour market should move along the same u - v curve for both increases and decreases in the demand for labour. Equations of type A.7, that is :

$$\begin{aligned} u &= a + b_1 v + b_2 d_1 + b_3 d_1 v + b_4 t' + b_5 \dot{u}' + e' \\ u &= a + b_1 v + b_2 d_1 + b_3 d_1 v + b_4 t' + b_5 \dot{v}' + e' \end{aligned} \quad (\text{A.7})$$

were estimated and confirm the conclusion arrived at as a result of the type A.2 estimated equations. Because of the consistent non-significance of the rate of change variables, the estimated type A.7 equations will not be presented.

The next section relates to testing for changes in the position of the u - v relationship by means of the inclusion of dummy variables as explanatory factors.

5.6 Testing for Changes in the Position of the u - v Relationship.

This section presents estimated equations for type A.3, A.4 and A.5 equations. That is,

$$u = a + b_1 v + b_2 d_1 + e' \quad (\text{A.3})$$

$$u = a + b_1 v + b_2 d_1 v + e' \quad (\text{A.4})$$

$$u = a + b_1 v + b_2 d_1 + b_3 d_1 v + e' \quad (\text{A.5})$$

The first step in testing for changes in the relationship involves the inclusion of shift dummy variables to determine whether a change in the intercept term has taken place. Shift dummy variables take the value of zero up to the time at which a change is assumed to have taken place and the value of unity thereafter. The quarters for which dummy variables were tested are outlined in section 5.3 (1967_s , 1967_d , 1972_m , 1972_j , 1972_s , 1972_d). Equations estimated using D_2

(1967_s) consistently performed better, in terms of \bar{R}^2 , D.W.S. and the coefficient on v , than those using D_1 (1967_j). This means that any change in the u - v relationship that occurred in 1967 took place as from and including the September quarter of that year. Results for D_1 are not presented.

This section is also concerned with testing for changes in the logarithmically linear form of the u - v relationship. This involves testing of equations of types B.3, B.4 and B.5. That is,

$$\log u = a' + b_1 \log v + b_2 d_1 + e'' \quad (B.3)$$

$$\log u = a' + b_1 \log v + b_2 d_1 \log v + e'' \quad (B.4)$$

$$\log u = a' + b_1 \log v + b_2 d_1 + b_3 d_1 \log v + e'' \quad (B.5)$$

Table 5.6.1 below presents estimated equations of types A.3 and B.3 for the u_r - v relationship. The estimated equations indicate that changes in the intercept term did take place in the 1964-73 period. The inclusion of shift dummy variables as explanatory factors results in a large improvement in \bar{R}^2 , the t -ratio on v and in the D.W.S. Equations a, b, c and d represent different 1972 quarters for the inclusion of the second shift dummy variable. The later the shift dummy variable is introduced in 1972, the greater in absolute terms are the values of the intercept and slope terms of the u_r - v relation and the coefficients on the shift dummy variables. The best fitting equation in terms of \bar{R}^2 is A.3a with 89 per cent of the variation in u_r accounted for. This compares with only 33 per cent of the variation accounted for by equation A.1a. The D.W.S. of 1.483 is greater than the upper limit of the test statistic at the 1% level of significance. This supports an hypothesis of zero positive autocorrelation in the residuals. The D.W.S. for equation A.3a of 1.483

Table 5.6.1

Type A.3 and B.3 Equations for the u_r-v
Relationship.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
A.3 a	$u_r = 1.994 - 0.834v - 0.081D_2 + 0.536D_3$ (22.969) (10.053) (2.240) ² (13.730) ³	0.891	1.483
A.3 b	$u_r = 2.113 - 0.953v - 0.088D_2 + 0.560D_4$ (22.578) (10.640) (2.263) ² (12.765) ⁴	0.877	1.372
A.3 c	$u_r = 2.251 - 1.090v - 0.097D_2 + 0.590D_5$ (20.527) (10.364) (2.178) ² (10.878) ⁵	0.841	0.924
A.3 d	$u_r = 2.376 - 1.214v - 0.098D_2 + 0.601D_6$ (15.992) (8.487) (1.681) ² (7.616) ⁶	0.740	1.212
B.3 a	$\bar{u}_r = 0.132 - 0.550\bar{v} - 0.048D_2 + 0.342D_3$ (6.130) (8.391) (1.518) ² (9.970) ³	0.841	0.914
B.3 b	$\bar{u}_r = 0.132 - 0.629\bar{v} - 0.057D_2 + 0.361D_4$ (6.214) (9.684) (1.791) ² (10.195) ⁴	0.846	0.920
B.3 c	$\bar{u}_r = 0.132 - 0.726\bar{v} - 0.070D_2 + 0.392D_5$ (6.247) (10.974) (2.203) ² (10.320) ⁵	0.849	0.857
B.3 d	$\bar{u}_r = 0.131 - 0.831\bar{v} - 0.083D_2 + 0.427D_6$ (5.648) (10.780) (2.323) ² (9.023) ⁶	0.317	1.444

compares with a value for equation A.1 a of 0.132. The coefficient on D_2 is significant for equation A.3a indicating that a shift of the u_r-v relation towards the origin took place as from 1967_s. The coefficient on D_3 is highly significant and suggests that an outward shift of the u_r-v relationship, more than offsetting the previous positional change, took place as from 1972_m.

The results for the estimated B.3 equations support the conclusion that changes in the position of the u_r-v relationship occurred in 1967 and 1972. The inclusion of shift dummy variables improves the fit of the equation in terms of \bar{R}^2 , the t-ratio on \bar{v} and the D.W.S. The constant term is not significantly affected by the timing of

introduction of the 1972 shift dummy; the coefficient on \bar{v} increases in absolute terms the later the 1972 shift dummy variable is introduced. The coefficient on D_2 is significantly different from zero in equations B.3c and B.3d only; the coefficient on the 1972 shift dummy is significantly different from zero in the four equations. The best fitting equation in terms of \bar{R}^2 and the t-ratio on \bar{v} is B.3c. This is the preferred equation, although it has the lowest and an unsatisfactory D.W.S. The value of \bar{R}^2 is 0.841 compared with 0.418 for B.1a and the D.W.S. is 0.857 for B.3c compared with only 0.129 for B.1a. The coefficients on both D_2 and D_5 are significantly different from zero indicating that changes in the $\bar{u}_r - \bar{v}$ relationship took place in 1967_s and 1972_s. The shift in 1967 was a small one towards the origin and that in 1972 a more substantial shift away from the origin.

Table 5.6.2 below presents results of the estimation of type A.3 and B.3 equations for the $u_{1f} - v$ relationship. The estimated A.3 equations demonstrate that a change in the position of the $u_{1f} - v$ relationship took place only in 1972. The inclusion of shift dummy variables greatly improves the fit of the estimated equations. The coefficient on D_2 is consistently negative, but is not significantly different from zero at the 5% level of significance. The coefficient on the 1972 shift dummy is consistently positive and significant. The best equation in terms of \bar{R}^2 is A.3e ; this equation has an \bar{R}^2 of 0.877 compared with 0.281 for A.1b. The D.W.S. of 1.924, compared with 0.285 for A.1b, is above the upper limit of the critical region indicating that there is no evidence of first order positive serial correlation in the residuals.

The estimated type B.3 equations support the conclusion that there was only one shift in the position of the $\bar{u}_{1f} - \bar{v}$ relationship in

Table 5.6.2

Type A.3 and B.3 Equations for the u_{1f} -v Relationship.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
A.3 e	$u_{1f} = 2.232 - 0.791v - 0.047D_2 + 0.583D_3$ (22.507) (8.532) (1.138) (13.058)	0.877	1.924
A.3 f	$u_{1f} = 2.356 - 0.915v - 0.050D_2 + 0.595D_4$ (20.417) (8.289) (1.040) (11.003)	0.839	2.272
A.3 g	$u_{1f} = 2.527 - 1.085v - 0.072D_2 + 0.665D_5$ (23.409) (10.480) (1.656) (12.458)	0.867	1.027
A.3 h	$u_{1f} = 2.637 - 1.195v - 0.061D_2 + 0.641D_6$ (15.574) (7.328) (0.926) (7.130)	0.708	1.399
B.3 e	$\bar{u}_{1f} = 0.356 - 0.393\bar{v} - 0.011D_2 + 0.298D_3$ (20.994) (7.635) (0.430) (11.049)	0.858	1.671
B.3 f	$\bar{u}_{1f} = 0.356 - 0.459\bar{v} - 0.015D_2 + 0.305D_4$ (19.425) (8.209) (0.457) (9.980)	0.835	1.998
B.3 g	$\bar{u}_{1f} = 0.355 - 0.547\bar{v} - 0.030D_2 + 0.343D_5$ (22.021) (10.790) (1.238) (11.777)	0.872	1.272
B.3 h	$\bar{u}_{1f} = 0.355 - 0.623\bar{v} - 0.034D_2 + 0.350D_6$ (16.801) (8.875) (1.040) (8.118)	0.780	1.691

the period 1964-73. The inclusion of shift dummy variables markedly improves the fit of the equations. The coefficient on D_2 is not significantly different from zero for all of the B.3 equations; the coefficient on the 1972 shift dummy is significant at the 5% level for each equation. The best fitting equation in terms of \bar{R}^2 and the t-ratio on v is B.3g. The \bar{R}^2 of 0.872 for this equation compares with 0.365 for B.1b. The D.W.S. of 1.272 falls within the critical region in the test for first order serial correlation at the 1% level and the test is therefore inconclusive. The only shift in the position of the \bar{u}_{1f} - \bar{v} relationship took place as from 1972_s.

The next stage in the testing for shifts in the position of the u-v relationship involves introducing slope dummy variables into the basic form of the u-v relation. This means testing of type A.4 and B.4 equations. Table 5.6.3 below presents results of the estimation of these types of equations for the u-v relationship.

Table 5.6.3

Type A.4 and B.4 Equations for the u-v Relationship.

Equation No.	E	Q	U	A	T	I	O	N	\bar{R}^2	D.W.S.
A.4 a	$u_x = 2.268 - 1.108v - 0.164D^{2v} + 0.655D^{3v}$	(41.608)	(19.776)	(5.758)	(19.832)				0.944	2.134
A.4 b	$u_x = 2.364 - 1.202v - 0.176D^{2v} + 0.680D^{4v}$	(40.233)	(19.950)	(5.847)	(18.866)				0.938	1.802
A.4 c	$u_x = 2.466 - 1.302v - 0.189D^{2v} + 0.703D^{5v}$	(34.083)	(17.610)	(5.209)	(15.638)				0.914	1.062
A.4 d	$u_x = 2.551 - 1.385v - 0.190D^{2v} + 0.703D^{6v}$	(24.211)	(12.922)	(3.714)	(10.566)				0.836	1.266
B.4 a	$u_x = 0.187 - 1.019v + 0.711D^{2v} - 0.356D^{3v}$	(6.277)	(3.503)	(2.112)	(1.765)				0.468	0.228
B.4 b	$u_x = 0.181 - 1.020v + 0.621D^{2v} - 0.253D^{4v}$	(6.005)	(3.436)	(1.830)	(1.230)				0.445	0.184
B.4 c	$u_x = 0.174 - 1.022v + 0.521D^{2v} - 0.104D^{5v}$	(5.699)	(3.382)	(1.562)	(0.458)				0.425	0.137
B.4 d	$u_x = 0.160 - 1.026v + 0.410D^{2v} + 0.297D^{6v}$	(5.282)	(3.443)	(1.261)	(1.113)				0.441	0.117

The estimated A.4 equations for the u-v relationship perform better than the A.3 equations, suggesting that changes in slope of the linear u-v relation are more dominant than changes in the intercept term. The best fitting equation is A.4a, although there is little to choose between this equation and A.4b. The \bar{R}^2 value of 0.944 compares with 0.891 for A.3a. The D.W.S. for A.4a is in excess of the upper limit of the critical region and supports the hypothesis

of zero first order positive serial correlation in the residuals. The coefficients on both the 1967 and the 1972 slope dummy variables are significant in all the A.4 equations for u_r-v . The results suggest that there was a small increase in the absolute slope of the u_r-v relation in 1967 and a more substantial decrease in absolute slope in 1972.

Type B.4 equations for the $\bar{u}_r-\bar{v}$ relationship generally perform unsatisfactorily. There is a limited increase in \bar{R}^2 and the D.W.S. as compared with B.1b, but the D.W.S. is very poor. The coefficients on both the 1967 and 1972 slope dummy variables appear to be of the wrong sign; the coefficient on the 1972 slope dummy is not significant, while that on $D_2\bar{v}$ is significant in equation B.4a only.

Estimated type A.4 and B.4 equations for the $u_{1f}-v$ relationship are presented in table 5.6.4 below. The estimated A.4 equations for the $u_{1f}-v$ relationship do not perform as well as the A.3 equations with respect to \bar{R}^2 and the D.W.S. The difference in the relative performance of the A.3 and A.4 equations is not great and this suggests that changes in both intercept and slope have played a part in the positional changes of the $u_{1f}-v$ relationship. The preferred equation is A.4e with an \bar{R}^2 of 0.844 compared with 0.877 for A.3e. The D.W.S. of 1.417 is marginally below the upper limit of the critical region and the test for first order serial correlation in the residuals is inconclusive. Unlike the coefficient on the 1967 shift dummy in A.3e, the coefficient on the 1967 slope dummy is significantly different from zero in the preferred equation A.4e, indicating that some change in the $u_{1f}-v$ relation may have taken place in 1967. The 1972 slope dummy is a significant variable in all A.4 equations and the extent of the change in slope is large relative to the shift in 1967. The absolute slope increased in 1967 and decreased in 1972.

Table 5.6.4

Type A.4 and B.4 Equations for the u_{1f} - v Relationship.

Equation No.	E Q U A T I O N	\bar{R}^2 D.W.S.
A.4 e	$u_{1f} = 2.549 - 1.103v - 0.126D_2^v + 0.663D_3^v$ (26.077) (10.976) (2.464) ² (11.201) ³	0.844 1.417
A.4 f	$u_{1f} = 2.638 - 1.190v - 0.133D_2^v + 0.675D_4^v$ (24.340) (10.710) (2.386) ² (10.162) ⁴	0.819 1.634
A.4 g	$u_{1f} = 2.756 - 1.306v - 0.156D_2^v + 0.722D_5^v$ (25.332) (11.747) (2.851) ² (10.676) ⁵	0.832 0.843
A.4 h	$u_{1f} = 2.814 - 1.362v - 0.141D_2^v + 0.687D_6^v$ (18.874) (8.982) (1.949) ² (7.292) ⁶	0.717 1.119
B.4 e	$\bar{u}_{1f} = 0.425 - 0.607\bar{v} + 0.491D_2^{\bar{v}} - 0.508D_3^{\bar{v}}$ (17.227) (2.524) (1.761) ² (3.042) ³	0.472 0.481
B.4 f	$\bar{u}_{1f} = 0.417 - 0.609\bar{v} + 0.361D_2^{\bar{v}} - 0.384D_4^{\bar{v}}$ (16.220) (2.404) (1.265) ² (2.190) ⁴	0.414 0.520
B.4 g	$\bar{u}_{1f} = 0.415 - 0.610\bar{v} + 0.301D_2^{\bar{v}} - 0.369D_5^{\bar{v}}$ (15.976) (2.374) (1.062) ² (1.922) ⁵	0.398 0.298
B.4 h	$\bar{u}_{1f} = 0.402 - 0.613\bar{v} + 0.174D_2^{\bar{v}} - 0.034D_6^{\bar{v}}$ (14.658) (2.274) (0.591) ² (0.143) ⁶	0.336 0.318

Like the counterparts for the \bar{u}_r - \bar{v} relationship, the estimated B.4 equations for the \bar{u}_{1f} - \bar{v} relationship generally do not perform satisfactorily. There is some increase in \bar{R}^2 , as compared with the B.1 equation, but the D.W.S. is unsatisfactory. Again the coefficients on the slope dummy variables appear to be of the wrong sign with respect to a priori expectations. The coefficient on $D_2^{\bar{v}}$ is not significant; the coefficient on the 1972 slope dummy variable is significantly different from zero for equations B.4e and B.4f only.

The next step in testing for changes in the position of the u - v relationship involves the simultaneous inclusion of both shift and slope dummy variables. The results for the u_r - v relationship are presented in table 5.6.5.

Table 5.6.5

Type A.5 and B.5 Equations for the $u_r - v$ Relationship.

Equation No.	E Q U A T I O N	\bar{r}^2	D.W.S
A.5 a	$u_r = 2.331 - 1.169v + 0.049D^2 - 0.237D^2v - 0.168D^3 + 0.847D^3v$ (17.815) (9.059) (0.279) ² (1.222) ² v (1.209) ³ (5.158) ³ v	0.943	2.073
A.5 b	$u_r = 2.331 - 1.169v + 0.196D^2 - 0.407D^2v - 0.239D^4 + 0.954D^4v$ (17.377) (8.836) (1.137) ² (2.168) ² v (1.781) ⁴ (6.073) ⁴ v	0.940	1.689
A.5 c	$u_r = 2.331 - 1.169v + 0.351D^2 - 0.587D^2v - 0.348D^5 + 1.095D^5v$ (15.259) (7.759) (1.859) ² (2.870) ² v (2.267) ⁵ (6.287) ⁵ v	0.923	1.026
A.5 d	$u_r = 2.331 - 1.169v + 1.554D^2 - 0.821D^2v - 0.734D^6 + 1.481D^6v$ (11.991) (6.097) (2.369) ² (3.237) ² v (3.380) ⁶ (6.389) ⁶ v	0.875	0.991
B.5 a	$u_r = 0.130 - 1.034v - 0.137D^2 + 0.056D^2v + 0.488D^3 + 0.682D^3v$ (12.025) (13.005) (6.392) ² (0.510) ² v (19.585) ³ (8.071) ³ v	0.960	2.106
B.5 b	$u_r = 0.130 - 1.034v - 0.142D^2 + 0.025D^2v + 0.498D^4 + 0.685D^4v$ (12.748) (13.787) (7.346) ² (0.255) ² v (21.784) ⁴ (9.337) ⁴ v	0.965	1.950
B.5 c	$u_r = 0.130 - 1.034v - 0.150D^2 - 0.023D^2v + 0.509D^5 + 0.706D^5v$ (12.467) (13.483) (7.810) ² (0.244) ² v (22.047) ⁵ (9.656) ⁵ v	0.963	1.634
B.5 d	$u_r = 0.130 - 1.034v - 0.164D^2 - 0.111D^2v + 0.513D^6 + 0.857D^6v$ (10.255) (11.091) (7.108) ² (0.988) ² v (17.930) ⁶ (8.983) ⁶ v	0.945	1.538

Table 5.6.6

Type A.5 and B.5 Equations for the $u_{lf} - v$ Relationship.

Equation No.	E Q U A T I O N	\bar{r}^2	D.W.S.
A.5 e	$u_{lf} = 2.326 - 0.885v - 0.215D^2 + 0.184D^2v + 0.649D^3 - 0.082D^3v$ (10.965) (4.230) (0.748) ² (0.584) ² v (2.890) ³ (0.307) ³ v	0.871	1.979
A.5 f	$u_{lf} = 2.326 - 0.885v + 0.118D^2 - 0.201D^2v + 0.408D^4 + 0.227D^4v$ (9.606) (3.705) (0.379) ² (0.593) ² v (1.684) ⁴ (0.800) ⁴ v	0.832	2.151
A.5 g	$u_{lf} = 2.326 - 0.885v + 0.256D^2 - 0.362D^2v + 0.540D^5 + 0.159D^5v$ (10.734) (4.141) (0.958) ² (1.247) ² v (2.479) ⁵ (0.644) ⁵ v	0.866	1.027
A.5 h	$u_{lf} = 2.326 - 0.885v + 0.598D^2 - 0.755D^2v + 0.085D^6 + 0.648D^6v$ (7.527) (2.904) (1.601) ² (1.871) ² v (0.245) ⁶ (1.756) ⁶ v	0.727	1.283
B.5 e	$u_{lf} = 0.355 - 0.626v - 0.009D^2 + 0.236D^2v + 0.310D^3 + 0.060D^3v$ (21.700) (5.208) (0.283) ² (1.428) ² v (8.243) ³ (0.462) ³ v	0.868	1.873
B.5 f	$u_{lf} = 0.355 - 0.626v - 0.036D^2 + 0.072D^2v + 0.342D^4 + 0.191D^4v$ (19.950) (4.788) (1.064) ² (0.427) ² v (8.582) ⁴ (1.493) ⁴ v	0.844	1.937
B.5 g	$u_{lf} = 0.355 - 0.626v - 0.045D^2 + 0.017D^2v + 0.366D^5 + 0.141D^5v$ (22.012) (5.283) (1.516) ² (0.117) ² v (10.240) ⁵ (1.244) ⁵ v	0.872	1.262
B.5 h	$u_{lf} = 0.355 - 0.626v - 0.067D^2 - 0.126D^2v + 0.385D^6 + 0.304D^6v$ (17.217) (4.132) (1.801) ² (0.690) ² v (8.273) ⁶ (1.961) ⁶ v	0.791	1.436

The estimated A.5 equations do not perform well relatively to the A.4 equations. The value of \bar{R}^2 is approximately the same, but the D.W.S., the t-ratio on v and the stability of the coefficients on the dummy variables are all better for the A.4 than the A.5 equations. The significance of the coefficients on D_2 , D_2v and the 1972 shift dummy is dependent on the time at which the 1972 dummy variables are introduced. The best fitting equation is A.5a and for this equation only the 1972 slope dummy variable, of the four dummy variables, is significant. The signs of the coefficients on the shift dummy variables have changed as compared with the A.3 equations.

Taking the results of the estimated A.3, A.4 and A.5 equations together the firm conclusion is arrived at that changes in the linear form of the u_r-v relationship took place in the period 1964-73. The results suggest an increase in the intercept term and the absolute slope of the relationship in 1967 and a decrease in the intercept term and the absolute slope of the relation in 1972. The changes in 1972 outweigh those in 1967 and variations in the slope of the u_r-v relationship dominate the positional shifts.

The simultaneous inclusion of shift and slope dummy variables significantly improves the fit of the $\bar{u}_r-\bar{v}$ relationship. Compared with either the B.3 or B.4 estimated equations there is a marked increase in \bar{R}^2 and the t-ratio on \bar{v} . The coefficients on the dummy variables exhibit stability and are not sensitive to the timing of the introduction of the 1972 dummy variables. The stability of the coefficients and the test statistics suggests that the set of B.5 equations is a satisfactory representation of the u_r-v relationship in the period 1964-73 and the best set of equations for that relationship. This conclusion is reinforced by the consistently high \bar{R}^2 and

satisfactory D.W.S. The coefficient on $D_2\bar{v}$ is universally insignificant and this indicates that the significance of D_2v in equations A.5b, A.5c and A.5d results from the non linear nature of the u_r-v relation in periods of high unemployment. Over a limited range of unemployment percentages a linear form of the u_r-v relation provides a reasonable approximation; for a broad range of unemployment percentages, as experienced in 1972, a linear form is unsatisfactory.

The best fitting equation is B.5b with an \bar{R}^2 of 0.965 and a D.W.S. of 1.950. The D.W.S. is above the upper limit of the critical region and supports the hypothesis of zero first order positive serial correlation in the residuals. Equation B.4b shows that there was a decrease in the constant term of the relationship, a movement towards the origin, in 1967 and, thus, a decrease in non demand-deficient unemployment. As from and including the June quarter of 1972 there was both a movement of the u_r-v relationship away from the origin, more than offsetting the 1967 change, and a decrease in the elasticity of u_r with respect to v . This change reflected an increase in non demand-deficient unemployment.

The estimated A.5 and B.5 equations are presented in table 5.6.6. The simultaneous inclusion of shift and slope dummy variables in the $u_{1f}-v$ relationship does not improve the fit of the estimated equations as compared with type A.3 equations. The best fitting equation with respect to \bar{R}^2 and the t-ratio on v is A.5e. The coefficients on D_2 , D_2v and the 1972 slope dummy variables are not of a consistent sign and are not significant in any of the four equations. The coefficient on the 1972 shift dummy is significant in the preferred equation A.5e and this suggests that a shift of the $u_{1f}-v$ relation away from the origin took place as from the March quarter of 1972. The results for type A.4 equations indicate that there

were changes in the slope of the u_{1f} - v relation in both 1967 and 1972, but this is not supported by the results for the A.5 equations. It is of note that equation A.5a for the u_r - v relation shows a change in slope as the dominant factor in 1972; A.5e suggests that the intercept term of the u_{1f} - v relationship changed in 1972.

In contrast with the results for the \bar{u}_r - \bar{v} relation, the B.5 equations for the \bar{u}_{1f} - \bar{v} relationship perform only slightly better than the B.3 equations in terms of \bar{R}^2 . The coefficients on the 1967 shift and slope dummy variables are not significantly different from zero at the 5% level of significance for any of the B.5 equations. The coefficient on the 1972 shift dummy variable is consistently positive and significant indicating that a shift of the \bar{u}_{1f} - \bar{v} relation away from the origin took place in 1972. The coefficient on the 1972 slope dummy variable is significantly different from zero in B.5h only. The best fitting equation in terms of \bar{R}^2 is B.5g, but this equation has a low D.W.S. Equation B.4e is the preferred equation and this suggests that a change in the \bar{u}_{1f} - \bar{v} relation took place as from and including the March quarter of 1972.

5.7 Time Trend Variable.

To test the possibility of a gradual shift of the u - v relationship over the 1964-73 period, a time trend (t') was introduced as an independent variable in the equations. The time trend variable took the value of zero for 1964_m and increased in value by one for each quarter thereafter.

The estimated equations including t' (type A.6 equations) are presented in table 7.5.1 for the u_r - v relationship. There is only a marginal improvement in the fit of the equations, in terms of \bar{R}^2 ,

Table 5.7.1

Type A.6 and B.6 Equations for the $u_r - v$ Relationship.

Equation No.	E Q U A T I O N								\bar{R}^2	D.W.S.
A.6 a	$u_r = 2.271 - 1.125v + 0.079D_2 - 0.316D_2v - 0.213D_3 + 0.862D_3v + 0.003t'$	(15.708)	(8.210)	(0.440) ²	(1.507) ²	(1.459) ³	(5.223) ³	(0.980)	0.943	2.047
A.6 b	$u_r = 2.230 - 1.094v + 0.204D_2 - 0.490D_2v - 0.279D_4 + 0.934D_4v + 0.004t'$	(15.785)	(8.127)	(1.223) ²	(2.613) ²	(2.116) ⁴	(6.128) ⁴	(1.813)	0.944	1.794
A.6 c	$u_r = 2.183 - 1.060v + 0.321D_2 - 0.659D_2v - 0.370D_5 + 1.022D_5v + 0.007t'$	(14.299)	(7.257)	(1.832) ²	(3.440) ²	(2.594) ⁵	(6.238) ⁵	(2.571)	0.934	1.261
A.6 d	$u_r = 2.105 - 1.001v + 0.464D_2 - 0.880D_2v - 0.729D_6 + 1.324D_6v + 0.010t'$	(11.600)	(5.756)	(2.250) ²	(3.972) ²	(3.860) ⁶	(6.401) ⁶	(3.445)	0.905	1.192
B.6 a	$\bar{u}_r = 0.122 - 1.014\bar{v} - 0.160D_2 + 0.023D_2\bar{v} + 0.473D_3 + 0.692D_3\bar{v} + 0.001t'$	(8.087)	(12.081)	(4.355) ²	(0.200) ²	(14.806) ³	(9.057) ³	(0.767)	0.960	2.097
B.6 b	$\bar{u}_r = 0.121 - 1.013\bar{v} - 0.164D_2 + 0.004D_2\bar{v} + 0.479D_4 + 0.677D_4\bar{v} + 0.001t'$	(8.903)	(12.941)	(5.422) ²	(0.037) ²	(15.918) ⁴	(9.172) ⁴	(0.954)	0.965	2.018
B.6 c	$\bar{u}_r = 0.118 - 1.005\bar{v} - 0.179D_2 - 0.040D_2\bar{v} + 0.481D_5 + 0.685D_5\bar{v} + 0.002t'$	(8.766)	(12.782)	(6.326) ²	(0.430) ²	(15.762) ⁵	(9.291) ⁵	(1.379)	0.964	1.790
B.6 d	$\bar{u}_r = 0.109 - 0.981\bar{v} - 0.213D_2 - 0.129D_2\bar{v} + 0.461D_6 + 0.808D_6\bar{v} + 0.003t'$	(7.009)	(10.721)	(6.786) ²	(1.205) ²	(12.709) ⁶	(8.668) ⁶	(2.198)	0.951	1.721

Table 5.7.2

Type A.6 and B.6 Equations for the $u_{lf} - v$ Relationship.

Equation No.	E Q U A T I O N								\bar{R}^2	D.W.S.
A.6 e	$u_{lf} = 2.242 - 0.822v - 0.173D_2 + 0.075D_2v + 0.584D_3 - 0.061D_3v + 0.004t'$	(9.529)	(3.689)	(0.591) ²	(0.218) ²	(2.454) ³	(0.227) ³	(0.849)	0.870	1.945
A.6 f	$u_{lf} = 2.131 - 0.740v + 0.134D_2 - 0.360D_2v + 0.331D_4 + 0.189D_4v + 0.009t'$	(8.417)	(3.067)	(0.447) ²	(1.073) ²	(1.403) ⁴	(0.690) ⁴	(1.954)	0.845	2.158
A.6 g	$u_{lf} = 2.112 - 0.726v + 0.213D_2 - 0.467D_2v + 0.509D_5 + 0.053D_5v + 0.010t'$	(9.800)	(3.522)	(0.861) ²	(1.726) ²	(2.529) ⁵	(0.229) ⁵	(2.651)	0.886	1.249
A.6 h	$u_{lf} = 1.980 - 0.628v + 0.459D_2 - 0.845D_2v + 0.091D_6 + 0.407D_6v + 0.015t'$	(6.776)	(2.241)	(1.383) ²	(2.368) ²	(0.299) ⁶	(1.221) ⁶	(3.277)	0.788	1.467
B.6 e	$\bar{u}_{lf} = 0.343 - 0.598\bar{v} - 0.042D_2 + 0.189D_2\bar{v} + 0.289D_3 + 0.067D_3\bar{v} + 0.002t'$	(15.033)	(4.705)	(0.756) ²	(1.064) ²	(5.974) ³	(0.513) ³	(0.731)	0.866	1.847
B.6 f	$\bar{u}_{lf} = 0.330 - 0.566\bar{v} - 0.100D_2 + 0.012D_2\bar{v} + 0.288D_4 + 0.170D_4\bar{v} + 0.004t'$	(14.222)	(4.246)	(1.936) ²	(0.069) ²	(5.629) ⁴	(1.349) ⁴	(1.612)	0.851	1.942
B.6 g	$\bar{u}_{lf} = 0.329 - 0.562\bar{v} - 0.108D_2 - 0.021D_2\bar{v} + 0.304D_5 + 0.095D_5\bar{v} + 0.004t'$	(16.269)	(4.767)	(2.559) ²	(0.150) ²	(6.642) ⁵	(0.557) ⁵	(2.018)	0.883	1.423
B.6 h	$\bar{u}_{lf} = 0.314 - 0.526\bar{v} - 0.162D_2 - 0.160D_2\bar{v} + 0.285D_6 + 0.210D_6\bar{v} + 0.006t'$	(12.824)	(3.637)	(3.261) ²	(0.947) ²	(4.978) ⁶	(1.428) ⁶	(2.647)	0.822	1.594

with the exception of A.6a. The coefficient on t' is marginally significant in A.6b and significantly different from zero in A.6c and A.6d. The best fitting equation is A.6b, in terms of \bar{R}^2 , and this reflects a change in the relation as from and including the June quarter of 1972.

The results for the B.6 equations show a slight increase in \bar{R}^2 for equations B.6c and B.6d. The coefficient on t' is significantly different from zero in B.6d only, the poorest fitting of the set of B.6 equations for the $\bar{u}_r - \bar{v}$ relation. The coefficient on t' is small and the general conclusion is that there is no substantive evidence of a gradual shift in the $u_r - v$ relation in the 1964-73 period.

The estimated A.6 and B.6 equations for the $u_{lf} - v$ relationship are presented in table 5.7.2. With the exception of A.6e, the estimated equations fit better than the A.5 equations. The coefficient on t' is marginally significant in equation A.6f and is significantly different from zero in A.6g and A.6h. The best fitting equation in terms of \bar{R}^2 is A.6g with a value for the test statistic of 0.886 compared with 0.866 for the A.5g equation. The coefficients on v , D_5 and t' are significantly different from zero in this equation. The D.W.S. for A.6g of 1.249 is an improvement on the value of 1.027 for A.5g, but is in the critical region where the test for first order serial correlation is inconclusive.

The inclusion of t' as an independent variable in the $\bar{u}_{lf} - \bar{v}$ relationship improves the fit of the equations, with the exception of B.6e. The coefficient on t' is small and significantly different from zero in B.6g and B.6h only. The best fitting equation is B.6g with an \bar{R}^2 of 0.883 and a D.W.S. of 1.423, marginally below the upper limit of the critical region. The coefficients on D_2 , D_5

and t' are significant, suggesting that there were shifts of the $\bar{u}_{1f}-\bar{v}$ relationship in both 1967 and 1972 and that there was a tendency for the relationship to move outwards through time.

The general conclusion from the results is that changes in the position of both the u_r-v and $u_{1f}-v$ relationships occurred in the 1964-73 period. These positional shifts reflected changes in the level of non demand-deficient unemployment in the Australian labour market.

The preferred equation for the u_r-v relationship is B.5b with an \bar{R}^2 of 0.965 and a D.W.S. of 1.950.

$$\bar{u}_r = 0.130 - 1.034\bar{v} - 0.142D_2 + 0.025D_2\bar{v} + 0.498D_4 + 0.685D_4\bar{v}$$

$$(12.748) (13.787) (7.346)^2 (0.255)^2 (21.784)^4 (9.337)^4$$

The coefficients on \bar{v} , D_2 , D_4 and $D_4\bar{v}$ are significantly different from zero in this equation. This result indicates that there is a relationship between u_r and v , that there was a change in the constant term of this relation in 1967_s and that there was a change in both the constant term and the elasticity of the relationship as from and including the June quarter of 1972.

The preferred equation for the $u_{1f}-v$ relationship is B.6g with an \bar{R}^2 of 0.883 and a D.W.S. of 1.423.

$$\bar{u}_{1f} = 0.329 - 0.562\bar{v} - 0.108D_2 - 0.021D_2\bar{v} + 0.304D_5 + 0.095D_5\bar{v} + 0.004t'$$

$$(16.269) (4.767) (2.559)^2 (0.150)^2 (6.642)^5 (0.857)^5 (2.018)$$

This estimated equation suggests that changes in the $u_{1f}-v$ relation took place in 1967_s and as from and including the September quarter of 1972. The positional changes of the relationship took the form of variations in the constant term and not the elasticity of u_{1f} with respect to v .

5.8 Sub-Period u-v Relationships.

This section presents estimated type A.1 and B.1 equations for segments of the 1964-73 period. For the purpose of determining the sub-periods, the change in both the u_r -v and u_{lf} -v relationships in 1972 is assumed to have occurred as from and including the June quarter. The following sub-periods are, thus, identified :

- (1) 1964_m - 1967_j
- (2) 1967_s - 1972_m
- (3) 1972_j - 1973_d

The first sub-period is of fourteen quarters duration, the second of nineteen quarters duration and the third of seven quarters only. Estimated u_r -v equations for each of the sub-periods are presented in table 5.8.1 below :

Table 5.8.1

Sub-Period u_r -v Relationships.

Sub-Period	E	Q	U	A	T	I	O	N	\bar{R}^2	D.W.S.
1.	u_r	=	2.331	-	1.169v				0.964	2.380
			(36.862)		(18.744)					
2.	u_r	=	2.527	-	1.576v				0.869	0.778
			(21.648)		(10.962)					
3.	u_r	=	2.288	-	0.623v				0.795	2.290
			(18.988)		(4.927)					
1.	\bar{u}_r	=	0.130	-	1.034 \bar{v}				0.956	2.131
			(15.550)		(16.817)					
2.	\bar{u}_r	=	-0.012	-	1.009 \bar{v}				0.935	1.315
			(0.699)		(16.109)					
3.	\bar{u}_r	=	0.486	-	0.324 \bar{v}				0.866	2.452
			(24.676)		(6.305)					

The linear form of the equation performs well with the exception of sub-period 2 for which the D.W.S. indicates the presence of first order serial correlation in the residuals. The coefficient on v is significantly different from zero in all equations and the \bar{R}^2 ranges from 0.964 for sub-period 1 to 0.795 for sub-period 3. The results indicate that there was an increase in both the intercept and the absolute slope of the u_r-v relation as between sub-periods 1 and 2; as between periods 2 and 3 there was a slight decrease in the intercept and a very large decrease in the absolute slope of the relationship. A Chow test was applied to the results, details of which are presented in Appendix 5.1, and this confirmed that all these changes were significant.

The log-linear form of the relationship fits well and the D.W.S. of 1.315 for sub-period 2 is above the upper limit of the critical region. There was a decrease in the constant term of the $\bar{u}_r-\bar{v}$ relation as between periods 1 and 2 and an increase between periods 2 and 3; there was a small decrease in the elasticity of the relationship between periods 1 and 2 and a further very large decrease between periods 2 and 3. A Chow test was applied to the results¹ and this confirmed that a significant change in the $\bar{u}_r-\bar{v}$ relationship occurred between both periods 1 and 2 and periods 2 and 3.

Estimates of the $\bar{u}_r-\bar{v}$ equation in the form $u = a.v^b$ are presented for each sub-period in table 5.8.2. Linear approximations of these equations, based on a truncated Taylor series² in the interval about the value $v = 1$, are also presented.

1. See Appendix 5.1.

2. The first two terms of the Taylor series expansion about the value "a" are used to derive the linear approximations :

$$\text{i.e. } f(x) = f(a) + \frac{f'(a)}{1!}(x-a)$$

Table 5.8.2Sub-Period Non Linear u_r -v Relationships.

Sub-Period	E Q U A T I O N
(1)	$u_r = 1.138v^{-1.034}$
(2)	$u_r = 0.988v^{-1.009}$
(3)	$u_r = 1.626v^{-0.324}$

Linear Approximations

(1)	$u_r = 2.315 - 1.177v$
(2)	$u_r = 1.985 - 0.997v$
(3)	$u_r = 2.153 - 0.527v$

The elasticity of u_r with respect to v was close to -1 for periods 1 and 2. The elasticity remained almost the same, but the relationship as a whole shifted towards the origin, in period 2 compared with period 1. The relationship moved outwards in period 3 and u_r became much less elastic with respect to changes in v . The linear approximations suggest that between periods 1 and 2 there was a decrease in both the intercept and slope of the relationship and an associated reduction in the level of non demand-deficient unemployment. In period 3, compared with period 2, there was an increase in the intercept term and a further substantial decrease in the absolute slope of the relationship. This change reflected an increase in non demand-deficient unemployment.

Both the linear relationships and the linear approximations are presented in graphical form in figure 5.8.1 parts a and b respectively.

Estimated u_{lf} -v relationships for each of the three sub-periods are presented in table 5.8.3 below. The fit of the linear form of

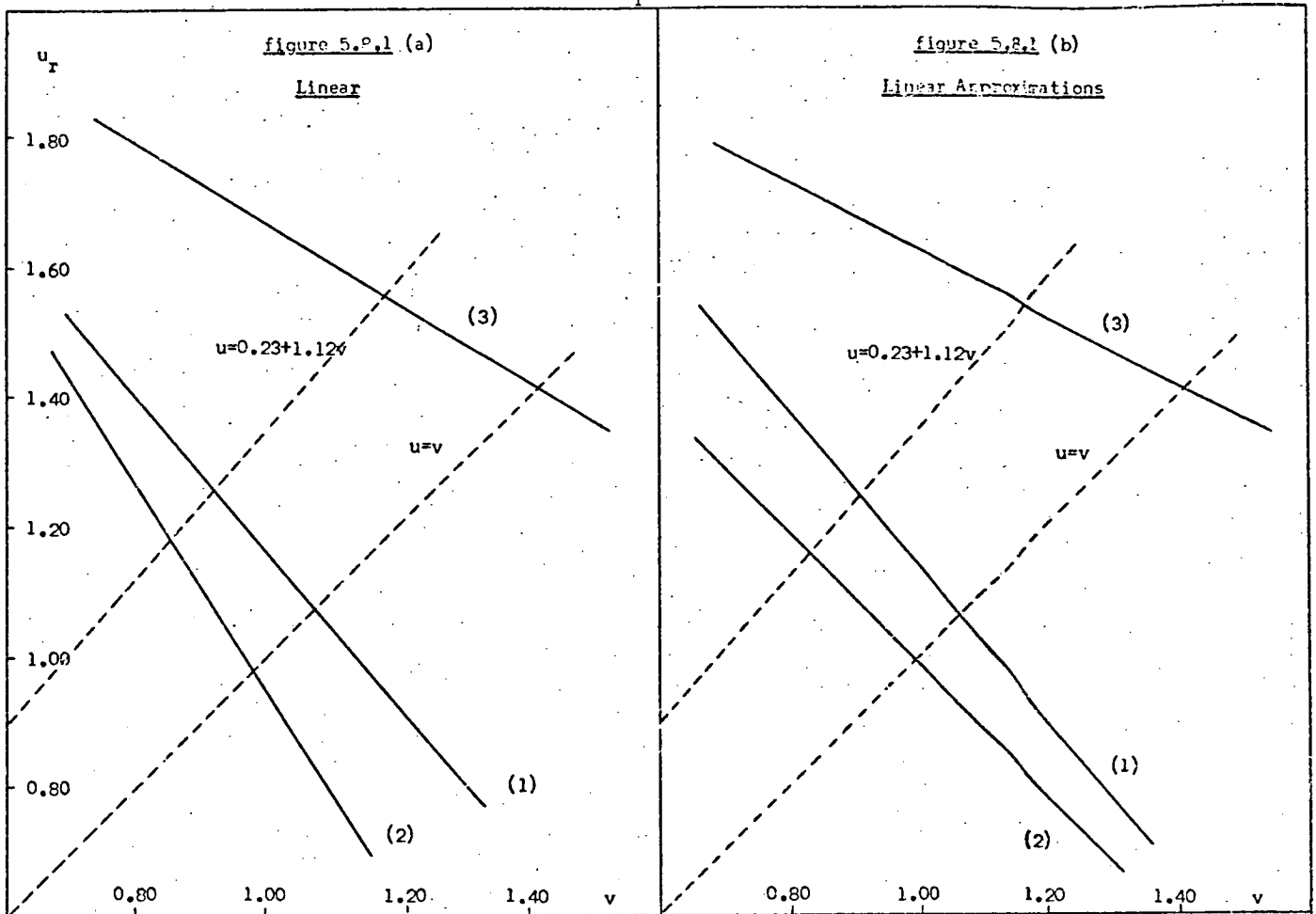
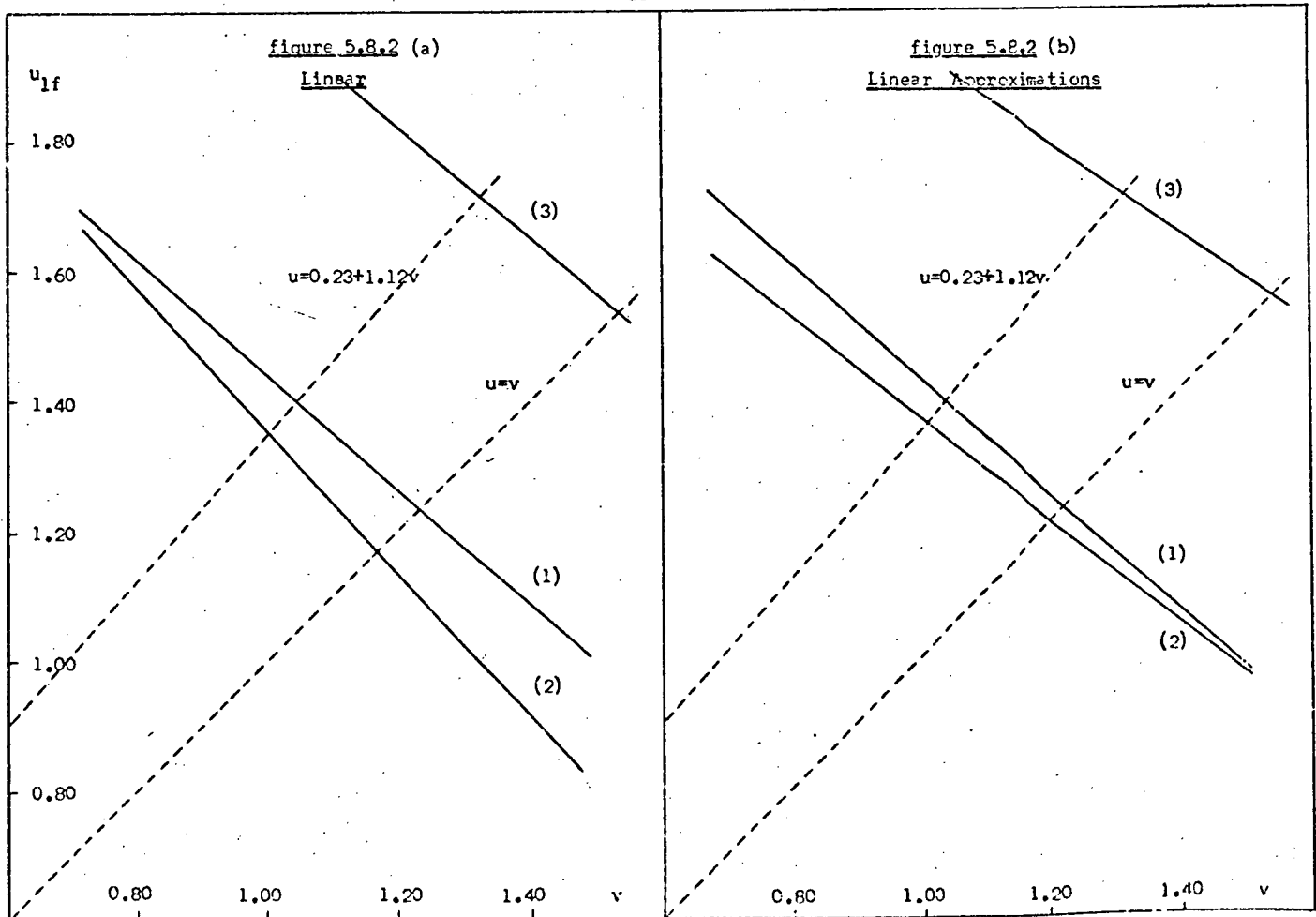
Sub-Period u_r - v Relationships.Sub-Period u_{lf} - v Relationships.

Table 5.8.3

Sub-Period u_{lf} -v Relationships.

Sub-Period	E	Q	U	A	T	I	O	N	\bar{R}^2	D.W.S.
1.	u_{lf}	=	2.326	-	0.885v				0.762	1.813
			(16.938)		(6.534)					
2.	u_{lf}	=	2.444	-	1.086v				0.478	0.893
			(11.514)		(4.182)					
3.	u_{lf}	=	2.852	-	0.860v				0.712	1.970
			(13.856)		(3.982)					
1.	\bar{u}_{lf}	=	0.355	-	0.626 \bar{v}				0.751	1.719
			(26.420)		(6.340)					
2.	\bar{u}_{lf}	=	0.319	-	0.554 \bar{v}				0.567	1.076
			(10.506)		(4.955)					
3.	\bar{u}_{lf}	=	0.661	-	0.365 \bar{v}				0.710	1.774
			(18.830)		(3.959)					

the u_{lf} -v equations is not as good as for the u_r -v equations, but the D.W.S. has a satisfactory value except for period 2. The results suggest an increase in the intercept term in period 2 as compared with period 1 and a further increase in period 3. The absolute slope of the relationship increased in period 2 and then decreased to approximately the same value as for period 1 in period 3. A Chow test¹ was applied to the results and this confirmed that a significant change in the u_{lf} -v relationship, both intercept and slope, occurred in 1972; the change in 1967 is not significant.

The results for the log-linear equations suggest that the constant term of the relationship decreased slightly in period 2 as compared with period 1 and then increased substantially in period 3. The elasticity of u_{lf} with respect to v decreased from period 1 to period 2 and then decreased further from period 2 to period 3. This confirms the result for the \bar{u}_r - \bar{v} relationship that each positional change has been associated with a decrease in the elasticity

1. See Appendix 5.1

of u with respect to v . A Chow test¹ was applied to the results and this confirmed that a significant change in the position of the u_{1f} - v relationship occurred in 1972, but not in 1967.

Estimates of the u_{1f} - v relationship in the form $u = a.v^b$ and linear approximations of these estimated equations are presented in table 5.8.4. The linear approximation equations indicate that changes in the position of the u_{1f} - v relation are dominated by changes in the intercept term rather than changes in slope. This is apparent in figure 5.8.2 which graphically portrays the linear equations and linear approximations for the u_{1f} - v relationship.

Table 5.8.4

Sub-Period Non Linear u_{1f} - v Relationships.

Sub-Period	E Q U A T I O N					
(1)	u_{1f}	=	1.426	$v^{-0.626}$		
(2)	u_{1f}	=	1.376	$v^{-0.554}$		
(3)	u_{1f}	=	1.935	$v^{-0.363}$		
<u>Linear Approximations</u>						
(1)	u_{1f}	=	2.319	-	0.893	v
(2)	u_{1f}	=	2.138	-	0.762	v
(3)	u_{1f}	=	2.639	-	0.703	v

5.9 Estimation of Non Demand-Deficient Unemployment.

The estimated sub-period u - v relationships were used in conjunction with estimates of the statement ratio to determine the level of non demand-deficient unemployment. Estimates of non demand-deficient unemployment are presented for two alternatives with respect to the

1. See Appendix 5.1

statement ratio. Firstly, assuming a statement ratio of unity, non demand-deficient unemployment is determined as the solution of the two equations below.

$$\begin{aligned} \text{i.e.} \quad u &= v \\ u &= a + b.v \end{aligned}$$

Secondly, assuming a statement ratio as estimated in section 4.4, we have :

$$\begin{aligned} u &= 0.23 + 1.12v \\ u &= a + b.v \end{aligned}$$

Estimates of non demand-deficient unemployment in terms of the number of persons registered for employment (i.e. $u_{\text{ndd}(r)}$) are presented in table 5.9.1. These estimates are derived from figure 5.8.1.

Table 5.9.1
Estimates of Non Demand-Deficient
Unemployment ($u_{\text{ndd}(r)}$)

Sub-Period	$u = v$		$u = 0.23 + 1.12v$	
	Linear	Lin. App.	Linear	Lin. App.
(1)	1.08	1.06	1.26	1.25
(2)	0.98	1.00	1.19	1.16
(3)	1.42	1.42	1.56	1.54

Based on the linear approximations and a statement ratio of unity, the value of $u_{\text{ndd}(r)}$ is 1.06 for period 1, decreases by 0.06 percentage points to 1.00 in period 2 and then increases by 0.42 percentage points to 1.42 in period 3. The value of $u_{\text{ndd}(r)}$ based on $u = 0.23 + 1.12v$ is 1.25 for period 1, decreases by 0.09 percentage points to 1.16 in period 2 and then increases by 0.38 percentage points to 1.54 in period 3.

Estimates of non demand-deficient unemployment for the u_{1f} - v relationship (i.e. $u_{\text{ndd}(1f)}$) are presented in table 5.9.2.

Table 5.9.2

Estimates of Non Demand-Deficient Unemployment ($u_{\text{ndd}(1f)}$)

Sub-Period	$u = v$		$u = 0.23 + 1.12v$	
	Linear	Lin. App.	Linear	Lin. App.
(1)	1.23	1.22	1.40	1.40
(2)	1.16	1.20	1.35	1.36
(3)	1.53	1.55	1.71	1.71

Based on the results for the linear approximations, the value of $u_{\text{ndd}(1f)}$ for $u=v$ is 1.22 in period 1, decreases slightly to 1.20 in period 2 and increases to 1.55 in period 3. The value of $u_{\text{ndd}(1f)}$ based on $u = 0.23 + 1.12v$ is 1.40 in period 1, decreases by 0.05 percentage points to 1.35 in period 2 and increases by 0.36 percentage points to 1.71 in period 3.

5.10 Demand-Deficient Unemployment.

Both unemployment and unfilled vacancies are used extensively as indicators of the demand for labour. Should changes in the level of non demand-deficient unemployment occur, either or both of these variables may become unreliable reflectors of changes in the demand for labour. The series on demand-deficient unemployment ($u_{\text{dd}} = u - u_{\text{ndd}}$) adjusts for changes in the level of non demand-deficient unemployment. Quarterly estimates of demand-deficient unemployment for both u_r ($u_{\text{dd}(r)}$) and u_{1f} ($u_{\text{dd}(1f)}$) are presented in Appendix 5.2. Annual averages of the u_{dd} series are presented in table 5.10.1. The decrease in non demand-deficient unemployment observed in 1967 would mean that for the years 1968-71 the unemployment series would suggest a higher demand for labour than that indicated by the demand-deficient unemployment series. That is, the unemployment series in that period overstated the demand for labour. In a

like manner the unemployment series understated the demand for labour in 1973. The demand-deficient unemployment series indicates that 1973 was similar to 1969 in terms of the demand for labour. The value of u_r for 1969 and 1973 was 1.13 and 1.55 respectively: a difference of 0.42 percentage points.

Table 5.10.1

Demand-Deficient Unemployment (u_{dd})

Year	$u_{dd}(r)$		$u_{dd}(lf)$	
	$u=v$	$u=0.23+1.12v$	$u=v$	$u=0.23+1.12v$
1964	0.07	-0.12	0.18	0.00
1965	-0.09	-0.28	0.10	-0.14
1966	0.20	0.02	0.28	0.10
1967	0.34	0.16	0.41	0.24
1968	0.33	0.17	0.35	0.19
1969	0.13	-0.03	0.36	0.20
1970	0.04	-0.12	0.20	0.04
1971	0.36	0.20	0.41	0.25
1972	0.59	0.46	0.83	0.67
1973	0.13	0.01	0.33	0.14

This chapter has demonstrated that the position of the $u-v$ relationship for Australia changed in 1967 and 1972. These changes reflected a reduction in the level of non demand-deficient unemployment in 1967 which was more than offset by a subsequent increase in 1972. Chapter 6 explores the nature of aggregate unemployment and unfilled vacancies and considers possible explanations of the changes in the level of non demand-deficient unemployment in the Australian labour market.

Appendix 5.1

Application of Chow Test¹ to Sub-Period u-v

Relationships.

A Chow test was applied to the results to perceive the significance of changes in the position of the u-v relationship. Assume that there are two sub-periods, the first with n observations on u and v and the second with m observations. The following two regressions between u and v are estimated :

$$\text{Sub-period 1 : } u = a_1 + b_1.v \quad (n \text{ observations})$$

$$\text{Sub-period 2 : } u = a_2 + b_2.v \quad (m \text{ observations})$$

Now, we also estimate the regression equation between u and v for n+m observations :

$$\text{i.e. } u = a + b.v \quad (n+m \text{ observations})$$

The first step in the application of the Chow test is to estimate the significance of the difference between the sets of coefficients for the two sub-period relationships. That is, the null hypothesis of equal coefficients is tested against the alternative hypothesis of unequal coefficients.

$$\text{i.e. } H_0 : a_1 = a_2 ; b_1 = b_2$$

$$H_1 : a_1 \neq a_2 ; b_1 \neq b_2$$

Chow outlines the procedure to be adopted in the application of the test :

"To test the equality between sets of coefficients in two linear regressions, we obtain the sum of squares of the residuals assuming the equality, and the sum of squares without assuming the equality. The ratio of the difference between these two sums to the latter sum, adjusted for the corresponding degrees of freedom, will be distributed as the F ratio under the null hypothesis." ²

1. G.C.Chow, "Tests of Equality Between Sets of Coefficients in Two

The test statistic is given by³ :

$$F (p, m+n-2p) = \frac{(A-B-C)/p}{(B+C)/(n+m-2p)}$$

A = sum of squares of residuals on n+m observations

B = sum of squares of residuals on n observations

C = sum of squares of residuals on m observations

p = number of parameters in regression equations (p=2)

If the value of the test statistic is less than the critical level in the F distribution, then the null hypothesis is accepted and we conclude that no change in the relationship has taken place. A test statistic outside the critical region means that the alternative hypothesis is accepted and we conclude that a structural shift of the relationship has occurred.

The values of the test statistic for both the u_r-v and $u_{lf}-v$ relationships are presented in table 1. At the 5% level of significance the test confirms changes in the position of the u_r-v relationship in both 1967 and 1972; there is no significant change in the $u_{lf}-v$ relationship for 1967, but the change in 1972 is significant.

Table 1

Chow Test 1 : Changes in
Relationship.

<u>Period</u>	u_r-v		$u_{lf}-v$	
	<u>linear</u>	<u>log-linear</u>	<u>linear</u>	<u>log-linear</u>
(1)-(2)	24.72	39.24	1.18	1.24
(2)-(3)	158.15	292.91	55.90	56.55

Linear Regressions", (Econometrica, vol. 28, 3, July, 1960) pp. 591-605.

2. Ibid. p. 602.

3. Ibid. p. 598.

The next step in the application of the Chow test involves testing separately for changes in the intercept and slope of the equations. Firstly, testing for changes in the intercept of the relationship requires the computation of a further regression equation :

$$u = a_1 + b_1.v + b_2.D \quad (m+n \text{ observations})$$

where D is a dummy variable taking the value of 0 up to the time of the change and a value of 1 thereafter.

Let the sum of the squares of the residuals for this regression equation be X. The test statistic is given by⁴ :

$$F(q, m+n-2p) = \frac{(A-X)/q}{X/(n+m-2p)}$$

where q is the number of parameters in the regression equation subject to testing (q=1).

If the value of the test statistic lies outside the critical region then the alternative hypothesis of a change in intercept is accepted. The values of the test statistic are presented in table 2. The test confirms ~~significant~~ changes in intercepts except for the $u_{lf}-v$ relationship in 1967.

Table 2

Chow Test 2 : Changes in
Intercept.

<u>Period</u>	u_r-v		$u_{lf}-v$	
	<u>linear</u>	<u>log-linear</u>	<u>linear</u>	<u>log-linear</u>
(1)-(2)	40.94	78.69	1.67	2.22
(2)-(3)	138.09	111.94	108.84	103.35

Testing for changes in slope requires the estimation of a further regression :

$$\text{i.e. } u = a_1 + b_1.v + b_2.Dv \quad (m+n \text{ observations})$$

Let the sum of the squares of the residuals for this regression equation be Y . The test statistic is given by :

$$F (q, m+n-2p) = \frac{(A-Y)/q}{Y/(m+n-2p)}$$

The values of the test statistic are presented in table 3. For the u_r-v relationship the test confirms changes in slope in both 1967 and 1972; the change in slope in 1972 for the log-linear equation is significant at the 10% level. The changes in slope for the $u_{lf}-v$ relationship are significant in 1972, but not in 1967.

Table 3

Chow Test 3 : Changes in Slope.

<u>Period</u>	u_r-v		$u_{lf}-v$	
	<u>linear</u>	<u>log-linear</u>	<u>linear</u>	<u>log-linear</u>
(1)-(2)	50.51	6.32	1.90	1.17
(2)-(3)	301.60	2.85 ⁺	99.47	9.29

+ Outside critical region at 10% level of significance, but not at 5% level. The reason for this low value is considered to be the unsatisfactory nature of testing for changes in elasticity only (see results for B.4 type equations).

Appendix 5.2Demand-Deficient Unemployment.

Quarter	$u_{dd}(r)$		$u_{dd}(1f)$	
	$u=v$	$u=0.23+1.12v$	$u=v$	$u=0.23+1.12v$
1964m	0.28	0.09	0.32	0.14
j	0.10	-0.09	0.26	0.08
s	-0.02	-0.21	0.11	-0.07
d	-0.07	-0.26	0.03	-0.15
1965m	-0.11	-0.30	0.00	-0.18
j	-0.15	-0.34	0.01	-0.17
s	-0.12	-0.31	0.12	-0.06
d	0.03	-0.16	0.27	0.09
1966m	0.14	-0.05	0.30	0.12
j	0.16	-0.03	0.19	0.01
s	0.25	0.06	0.37	0.19
d	0.27	0.08	0.27	0.09
1967m	0.27	0.08	0.35	0.17
j	0.32	0.13	0.44	0.26
s	0.42	0.26	0.49	0.33
d	0.34	0.18	0.37	0.21
1968m	0.38	0.22	0.38	0.22
j	0.39	0.23	0.41	0.25
s	0.29	0.13	0.32	0.16
d	0.26	0.10	0.30	0.14
1969m	0.22	0.06	0.33	0.17
j	0.16	0.00	0.30	0.14
s	0.05	-0.11	0.28	0.12
d	0.08	-0.08	0.51	0.35
1970m	0.00	-0.16	0.20	0.04
j	-0.02	-0.18	0.17	0.01
s	0.09	-0.07	0.19	0.03
d	0.11	-0.05	0.23	0.07
1971m	0.18	0.02	0.28	0.12
j	0.26	0.10	0.35	0.19
s	0.39	0.23	0.38	0.22
d	0.59	0.43	0.64	0.48
1972m	0.76	0.60	0.95	0.79
j	0.46	0.34	0.50	0.34
s	0.65	0.53	1.01	0.85
d	0.50	0.38	0.86	0.70
1973m	0.19	0.07	0.62	0.46
j	0.16	0.04	0.34	0.18
s	0.10	-0.02	0.13	-0.03
d	0.08	-0.04	0.22	0.06

CHAPTER 6

AGGREGATIVE DETERMINANTS OF NON

DEMAND - DEFICIENT UNEMPLOYMENT.

6.1 Introduction.

The purpose of this chapter is to explore the nature of the changes in position of the u-v relationship through analysing the behaviour of the incidence and duration of both unemployment and unfilled vacancies and to determine whether changes in aggregate labour market demand and supply variables have caused the observed shifts in position of the relationship.

Section 2 contains a general introduction to testing for changes in the relation between flows in the labour market and the unemployment and unfilled vacancies percentages. An analysis of this relation will serve to elucidate the nature of changes in the u-v relationship. Section 3 examines the incidence and duration of C.E.S. unemployment and section 4 the incidence and duration of L.F.S. unemployment. Section 5 is concerned with the behaviour of the incidence and duration of unfilled vacancies.

Data on the turnover behaviour of members of the labour force in the period 1964-73 are analysed in section 6 and an attempt is made to relate these data to the incidence of unemployment and unfilled vacancies. Section 7 introduces data obtained from two surveys of labour force experience undertaken in 1968 and 1972 by the Australian Bureau of Statistics.

Section 8 considers the relationship between changes in unemployment and unfilled vacancies and the aggregate demand for goods and services and tests for shifts in this relationship. Section 9 observes the behaviour of the supply of labour in the period 1964-73, changes in the labour force as a whole and changes in the population of working age and the participation rate separately. Section 10 relates to the behaviour of labour demand variables : total demand for labour, employment and the productivity of labour employed.

6.2 Flows in the Labour Market.

The ensuing three sections test the behaviour of the incidence and duration of both unemployment and unfilled vacancies. The purpose of this testing is to explore the impact of flows in the labour market on the position of the u-v relationship and, in particular, on the observed changes in position of that relationship. Changes in unemployment reflect changes in the incidence or duration of unemployment or some combination of both; changes in the unfilled vacancies percentage similarly reflect changes in the incidence or duration of unfilled vacancies. The behaviour of flows in the labour market will be reflected by the incidence and duration of unemployment and unfilled vacancies.

The equations to be tested with respect to the incidence and duration of unemployment are outlined in section 3.6.6; those relating to the incidence and duration of unfilled vacancies are set out in section 3.6.8. The dependent variable is initially specified as a function of either the unemployment percentage or the unfilled vacancies percentage. The rate of change of unemployment or unfilled vacancies is then included since the value of the dependent variable will most probably be affected by the direction of change in the

demand for labour. Shift dummy variables and a time trend variable are then introduced to test for changes in the behaviour of the incidence and duration of unemployment and unfilled vacancies in the period 1964-73. The final step in the testing is the addition of slope dummy variables to examine the possibility that the behaviour of the variables has changed, but only at certain levels of the demand for labour.

The testing of relationships is supplemented by an analysis of the contributions of changes in the incidence and duration variables to the total change in the unemployment or unfilled vacancies percentage.

6.3 Incidence and Duration of C.E.S. Unemployment.

The estimated type C.1 equations for C.E.S. unemployment are presented in table 6.3.1. In equation C.1.1 the coefficient on u_r is positive, as expected, and significant : the incidence of unemployment moves in the same direction as the unemployment percentage. The coefficient on \dot{u}_r in C.1.2 is significant, but of very small magnitude and this indicates that the incidence of unemployment is relatively insensitive to the direction and rate of change of the unemployment percentage. The coefficients on D_2 , D_4 and t' in C.1.3 are insignificant; the coefficient on \dot{u}_r is zero and \dot{u}_r is excluded as an independent variable from C.1.4. The inclusion of both shift and slope dummy variables, C.1.4, improves the fit of the equation with 81 per cent of the variation in I_{ur} explained. The coefficient on u_r is not significantly different from zero at the 5% level; the coefficients on the 1967 shift and slope dummy variables are significant as is the positive coefficient on t' ; the coefficients on the

Table 6.3.1

Type C.1 and C.2 Equations : C.E.S. Unemployment.

(Incidence Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
C.1.1	$I_{ur} = 0.220 + 0.102u_r$ (15.837) (9.826) ^r	0.710	1.537
C.1.2	$I_{ur} = 0.219 + 0.103u_r + 0.001\dot{u}_r$ (17.262) (10.779) ^r (2.746) ^r	0.757	1.812
C.1.3	$I_{ur} = 0.204 + 0.106u_r + 0.000\dot{u}_r - 0.011D_r - 0.026D_r^2 + 0.001t'$ (11.844) (7.654) ^r (0.917) ^r (0.899) ² (1.776) ⁴ (1.607)	0.767	1.772
C.1.4	$I_{ur} = 0.277 + 0.039u_r - 0.131D_r^2 + 0.090D_r^2u_r - 0.065D_r^4 + 0.009D_r^4u_r + 0.002t'$ (9.835) (1.562) ^r (3.429) ² (3.025) ² ^r (1.232) ⁴ (0.298) ⁴ ^r (3.711)	0.813	2.189
C.2.1	$I_{ur} = 0.447 - 0.105v$ (22.515) (4.818)	0.363	0.657
C.2.2	$I_{ur} = 0.446 - 0.105v + 0.000\dot{v}$ (22.130) (4.734) (0.069)	0.346	0.659
C.2.3	$I_{ur} = 0.433 - 0.111v - 0.000\dot{v} - 0.037D_r + 0.023D_r^4 + 0.002t'$ (24.967) (6.787) (0.599) (2.746) ² (1.736) ⁴ (2.901)	0.722	1.806
C.2.4	$I_{ur} = 0.356 - 0.038v + 0.097D_r^2 - 0.160D_r^2v - 0.059D_r^4 + 0.090D_r^4v + 0.003t'$ (11.052) (1.232) (2.535) ² (3.733) ² (1.940) ⁴ (2.568) ⁴ ^r (4.687)	0.798	1.956

Table 6.3.2

Type C.3 and C.4 Equations : C.E.S. Unemployment.

(Duration Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
C.3.1	$D_{ur} = 1.479 + 1.675u_r$ (9.845) (14.872) ^r	0.850	1.255
C.3.2	$D_{ur} = 1.481 + 1.675u_r - 0.011\dot{u}_r$ (10.529) (15.890) ^r (2.526) ^r	0.868	1.433
C.3.3	$D_{ur} = 1.550 + 1.693u_r - 0.007\dot{u}_r + 0.092D_r^2 + 0.160D_r^4 - 0.009t'$ (7.856) (10.635) ^r (1.138) ^r (0.629) ² (0.963) ⁴ (1.137)	0.864	1.371
C.3.4	$D_{ur} = 0.530 + 2.649u_r + 1.636D_r^2 - 1.140D_r^2u_r + 1.377D_r^4 - 0.540D_r^4u_r - 0.022t'$ (1.831) (10.392) ^r (4.176) ² (3.739) ² ^r (2.530) ⁴ (1.658) ⁴ ^r (4.072)	0.912	2.123
C.4.1	$D_{ur} = 4.744 - 1.209v$ (14.228) (3.307)	0.203	0.396
C.4.2	$D_{ur} = 4.793 - 1.271v + 0.013\dot{v}$ (14.614) (3.530) (1.618)	0.236	0.457
C.4.3	$D_{ur} = 4.952 - 1.448v - 0.003\dot{v} - 0.065D_r + 1.129D_r^4 - 0.008t'$ (18.485) (5.767) (0.567) (0.314) ² (5.442) ⁴ (0.713)	0.708	1.153
C.4.4	$D_{ur} = 6.559 - 2.991v - 0.630D_r^2 + 0.507D_r^2v - 0.520D_r^4 + 2.037D_r^4v - 0.016t'$ (16.906) (8.102) (1.363) ² (0.983) ² (1.426) ⁴ (4.825) ⁴ ^r (2.485)	0.870	2.223

1972 shift and slope dummy variables are not significant. These results suggest the following regarding the incidence of C.E.S. unemployment :

1. In the period 1964_m-1967_j I_{ur} moved in the same direction as u_r , but not sufficiently to render the coefficient on u_r significant.
2. A change occurred in the behaviour of I_{ur} in 1967 : the constant term decreased and the coefficient on u_r increased (from 0.039 to 0.129) - I_{ur} became more sensitive to u_r .
3. A similar change is apparent in 1972, but not of sufficient magnitude for the coefficients on D_4 and $D_4 u_r$ to be significantly different from zero.
4. I_{ur} increased throughout the period 1964-73 : a total time trend increase of approximately 0.080.

Estimated type C.2 equations for C.E.S. unemployment are presented in table 6.3.1. In C.2.1 the coefficient on v is negative and significant, but only 36 per cent of the variation in I_{ur} is explained; the inclusion of \dot{v} as an independent variable does not improve the fit of the equation and the coefficient on \dot{v} is not significant. In equation C.2.3 shift dummy variables are added and a marked improvement in the fit of the relation results : 72 per cent of the variation in I_{ur} is explained.

Both shift and slope dummy variables are included in C.2.4 and a further improvement in fit results. The dummy variables for 1967 are significant and the coefficients suggest that I_{ur} became more sensitive to v as from 1967; this change was partially offset by a subsequent change in 1972. In general, I_{ur} increased steadily in

relation to v in the period 1964-73 and became more sensitive to v as from 1967.

Type C.3 equations for C.E.S. unemployment are presented in table 6.3.2. Equation C.3.1 indicates that the duration of registered unemployment is sensitive to u_r : 85 per cent of the variation in D_{ur} is explained by the inclusion of u_r as the sole independent variable. The addition of \dot{u}_r in C.3.2 results in a small improvement in fit; the inclusion of shift dummy variables does not improve the fit of the equation. Both shift and slope dummy variables are included as independent variables in C.3.4 and \bar{R}^2 increases to 0.912. Equation C.3.4 is the best fitting equation and suggests the following regarding the behaviour of the duration of C.E.S. unemployment :

1. D_{ur} is sensitive to, and moves in accord with, u_r .
2. A change occurred in the behaviour of D_{ur} in the year 1967 : the constant term increased and the coefficient on u_r decreased (from 2.649 to 1.509) : D_{ur} became less sensitive to u_r .
3. A similar change occurred in 1972 with a further increase in the constant term and decrease in slope (to 0.969), although the coefficient on $D_4 u_r$ is not significantly different from zero.
4. D_{ur} decreased through time in the period 1964-73 : a total time trend decrease of 0.880.

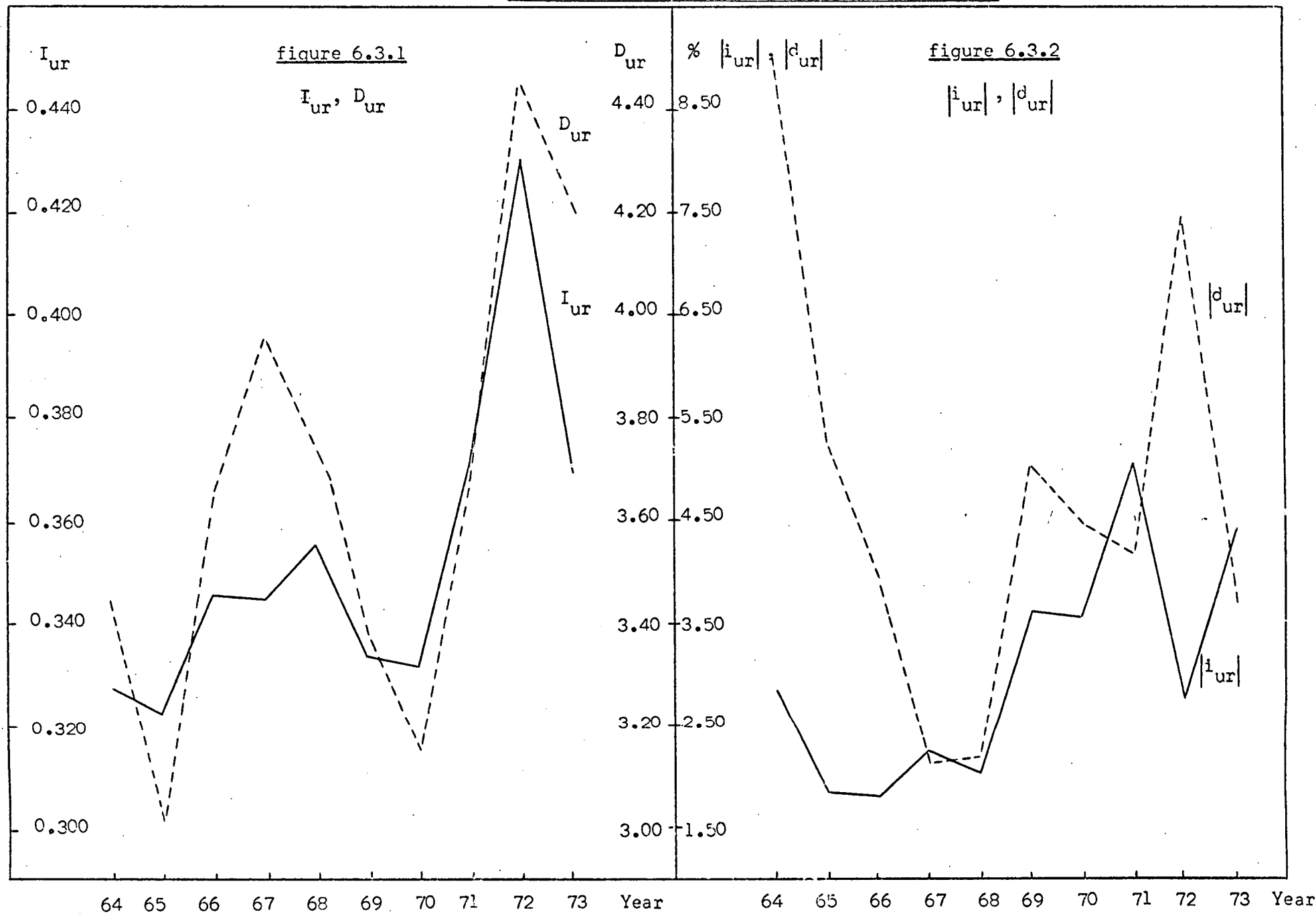
Estimated type C.4 equations for C.E.S. unemployment are also presented in table 6.3.2. The coefficient on v is negative and significantly different from zero throughout the set of equations. The addition of shift and slope dummy variables markedly improves the fit of the equation. In C.4.4 the coefficients on D_2 , $D_2 v$ and D_4 are insignificant; the coefficient on $D_4 v$ is positive and indicates that

D_{ur} was less sensitive to v as from 1972_j; the coefficient on t' is negative as in C.3.4.

Annual averages of I_{ur} and D_{ur} are presented graphically in figure 6.3.1. In the years 1964 to 1970, I_{ur} remained stable varying between 0.323 and 0.356; the incidence of C.E.S. unemployment increased markedly in 1971-72. The duration of C.E.S. unemployment was more sensitive to u_r than the incidence of unemployment throughout most of the period 1964-73. Variations in D_{ur} accounted for approximately 64 per cent¹ of the variation in u_r . This is demonstrated in figure 6.3.2 which graphically depicts the annual averages of the absolute percentage deviation in I_{ur} (i_{ur}) and D_{ur} (d_{ur}). The percentage variation in D_{ur} is generally greater than the variation in I_{ur} . This is especially so in the first few years of the period and to a lesser extent only in the period from 1967.

The results of this section have demonstrated that, although changes in the duration of unemployment are more important with respect to changes in the unemployment percentage, the changes that took place in the period 1964-73 were in the direction of increasing variability in the incidence and decreasing variability in the duration of registered unemployment. The incidence of C.E.S. unemployment increased over time while the duration of unemployment decreased. The higher incidence of unemployment reflects an increased flow of unemployed persons onto the C.E.S. register and this in turn suggests that the turnover behaviour of members of the labour force may have changed. The increase in the incidence of unemployment would, other things being equal, have the effect of moving the u - v relationship away from the origin, thus increasing the level of non demand-deficient unemployment.

1. Given by $|\bar{d}_{ur}| / (|\bar{d}_{ur}| + |\bar{i}_{ur}|)$ expressed as a percentage.



6.4 Incidence and Duration of L.F.S. Unemployment.

Estimated type C.1 equations for L.F.S. unemployment are presented as equations C.1.5 to C.1.8 in table 6.4.1. In C.1.5 the coefficient on u_{1f} is positive and 58 per cent of the variation in I_{ulf} is explained. The addition of \dot{u}_{1f} , shift and slope dummy variables and t' as independent variables improves the fit of the equation: \bar{R}^2 for both C.1.7 and C.1.8 equals 0.891. In equation C.1.8 the coefficients on all four shift and slope dummy variables are not significantly different from zero; the coefficient on u_{1f} is positive, indicating that I_{ulf} moves in the same direction as u_{1f} , and significant; the coefficient on \dot{u}_{1f} is significantly different from zero and positive - this means that as unemployment rises the incidence of unemployment increases more than proportionately to unemployment. The only significant change in the behaviour of the incidence of unemployment in the period 1964-73 is the gradual increase in the value of I_{ulf} over time: the coefficient on t' is positive and significant. The total time trend increase for the period is approximately 0.060, which is a large shift in relation to the mean value of I_{ulf} for the period of 0.161.

Type C.2 equations for L.F.S. unemployment are presented as equations C.2.5 to C.2.8 in table 6.4.1. In equation C.2.5 the coefficient on v is negative and significant and 28 per cent of the variation in I_{ulf} is explained. The addition of \dot{v} , shift and slope dummy variables and t' markedly improves the fit of the equation: \bar{R}^2 rises to 0.940, a value in excess of that for C.1.8. In equation C.2.8 the coefficients on all variables are significantly different from zero; the coefficients on D_4 and D_4v are of the opposite sign and of similar magnitude to those for D_2 and D_2v respectively - that is, the change in 1972 offset, approximately, the change in 1967. These changes, thus,

Table 6.4.1

Type C.1 and C.2 Equations : L.F.S. Unemployment.

(Incidence Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
C.1.5	$I_{ulf} = 0.002 + 0.099u_{lf}$ (0.072) (7.353)	0.576	0.596
C.1.6	$I_{ulf} = 0.001 + 0.099u_{lf} + 0.002\dot{u}_{lf}$ (0.070) (8.105) (3.054)	0.652	0.681
C.1.7	$I_{ulf} = 0.039 + 0.051u_{lf} + 0.002\dot{u}_{lf} + 0.009D_2 - 0.004D_4 + 0.002t'$ (2.496) (4.754) (4.105) (0.968) ² (0.369) ⁴ (3.630)	0.891	1.355
C.1.8	$I_{ulf} = 0.004 + 0.076u_{lf} + 0.002\dot{u}_{lf} + 0.039D_2 - 0.019D_4 + 0.042D_4 - 0.022D_4u_{lf} + 0.002t'$ (0.117) (2.923) (4.197) (0.824) ² (0.613) ² (0.925) ⁴ (0.938) ⁴ (2.896)	0.891	1.431
C.2.5	$I_{ulf} = 0.257 - 0.107v$ (10.590) (4.033)	0.281	0.191
C.2.6	$I_{ulf} = 0.255 - 0.105v - 0.000\dot{v}$ (10.423) (3.906) (0.812)	0.275	0.180
C.2.7	$I_{ulf} = 0.185 - 0.075v - 0.001\dot{v} - 0.007D_2 + 0.026D_4 + 0.002t'$ (17.326) (7.500) (3.956) (0.900) ² (3.096) ⁴ (5.267)	0.921	1.535
C.2.8	$I_{ulf} = 0.172 - 0.062v - 0.001\dot{v} + 0.052D_2 - 0.073D_4 - 0.041D_4 + 0.078D_4v + 0.002t'$ (8.355) (3.221) (3.869) (2.169) ² (2.655) ² (2.066) ⁴ (3.538) ⁴ (5.896)	0.940	2.308

Table 6.4.2

Type C.3 and C.4 Equations : L.F.S. Unemployment.

(Duration Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
C.3.5	$D_{ulf} = 8.242 + 0.006u_{lf}$ (7.200) (0.009)	-0.026	0.348
C.3.6	$D_{ulf} = 8.256 + 0.013u_{lf} - 0.073\dot{u}_{lf}$ (7.622) (0.919) (2.336)	0.081	0.382
C.3.7	$D_{ulf} = 6.829 + 2.266u_{lf} - 0.050\dot{u}_{lf} - 0.409D_2 + 0.859D_4 - 0.109t'$ (9.118) (4.502) (2.841) (0.940) ² (1.744) ⁴ (4.680)	0.778	1.430
C.3.8	$D_{ulf} = 5.747 + 3.107u_{lf} - 0.049\dot{u}_{lf} - 0.580D_2 + 0.197D_4 + 5.103D_4 - 2.194D_4u_{lf} - 0.109t'$ (3.403) (2.596) (2.827) (0.267) ² (0.141) ² (2.419) ⁴ (2.015) ⁴ (5.153)	0.792	1.593
C.4.5	$D_{ulf} = 7.714 + 0.605v$ (8.015) (0.573)	-0.018	0.362
C.4.6	$D_{ulf} = 7.935 + 0.323v + 0.057\dot{v}$ (8.854) (0.328) (2.682)	0.125	0.486
C.4.7	$D_{ulf} = 11.963 - 2.010v + 0.040\dot{v} - 0.860D_2 + 1.752D_4 - 0.087t'$ (18.840) (3.376) (2.875) (1.762) ² (3.564) ⁴ (3.414)	0.749	1.931
C.4.8	$D_{ulf} = 14.019 - 3.949v + 0.038\dot{v} - 1.255D_2 + 0.348D_4 - 0.569D_4 + 3.004D_4v - 0.103t'$ (10.729) (3.225) (2.898) (0.822) ² (0.200) ² (0.451) ⁴ (2.155) ⁴ (4.092)	0.785	2.116

reflected the changes in the behaviour of unemployment relative to unfilled vacancies. The time trend variable is positive as in C.1.8. The conclusion derived from these results is that the only significant change in the behaviour of the incidence of L.F.S. unemployment in the period 1964-73 was the gradual increase over time.

Type C.3 equations for L.F.S. unemployment, relating to the average duration of unemployment, are presented as equations C.3.5 to C.3.8 in table 6.4.2. Equation C.3.5 tends to suggest that D_{ulf} is not sensitive to changes in the unemployment percentage. The inclusion of \bar{u}_{1f} , shift dummy variables and t' in C.3.7 improves the fit of the equation and renders the coefficient on u_{1f} significantly positive. The reason for the non-significance of u_{1f} in C.3.5 and C.3.6 would seem to be the dominance of a time trend decrease in the value of D_{ulf} . The inclusion of slope dummy variables results in a further slight increase in \bar{R}^2 . In equation C.3.8 the coefficient on u_{1f} is positive indicating that D_{ulf} is sensitive, in the same direction, to changes in u_{1f} ; the coefficient on \bar{u}_{1f} is significantly negative and this suggests that the average duration of unemployment changes proportionately less than the unemployment percentage. The reason for this behaviour is that as unemployment increases the duration of unemployment is weighted by persons newly unemployed who initially have experienced only short periods of unemployment. These newly unemployed persons have the effect of reducing the average duration of unemployment. The coefficients on the 1967 dummy variables are not significantly different from zero; the coefficients on D_4 and $D_4 u_{1f}$ are significant and indicate that the average duration of unemployment became less sensitive to the unemployment percentage as from 1972_j. The coefficient on t' is negative and significant : the approximate time trend decrease in D_{ulf} is about four weeks and this is the major change in the behaviour of the

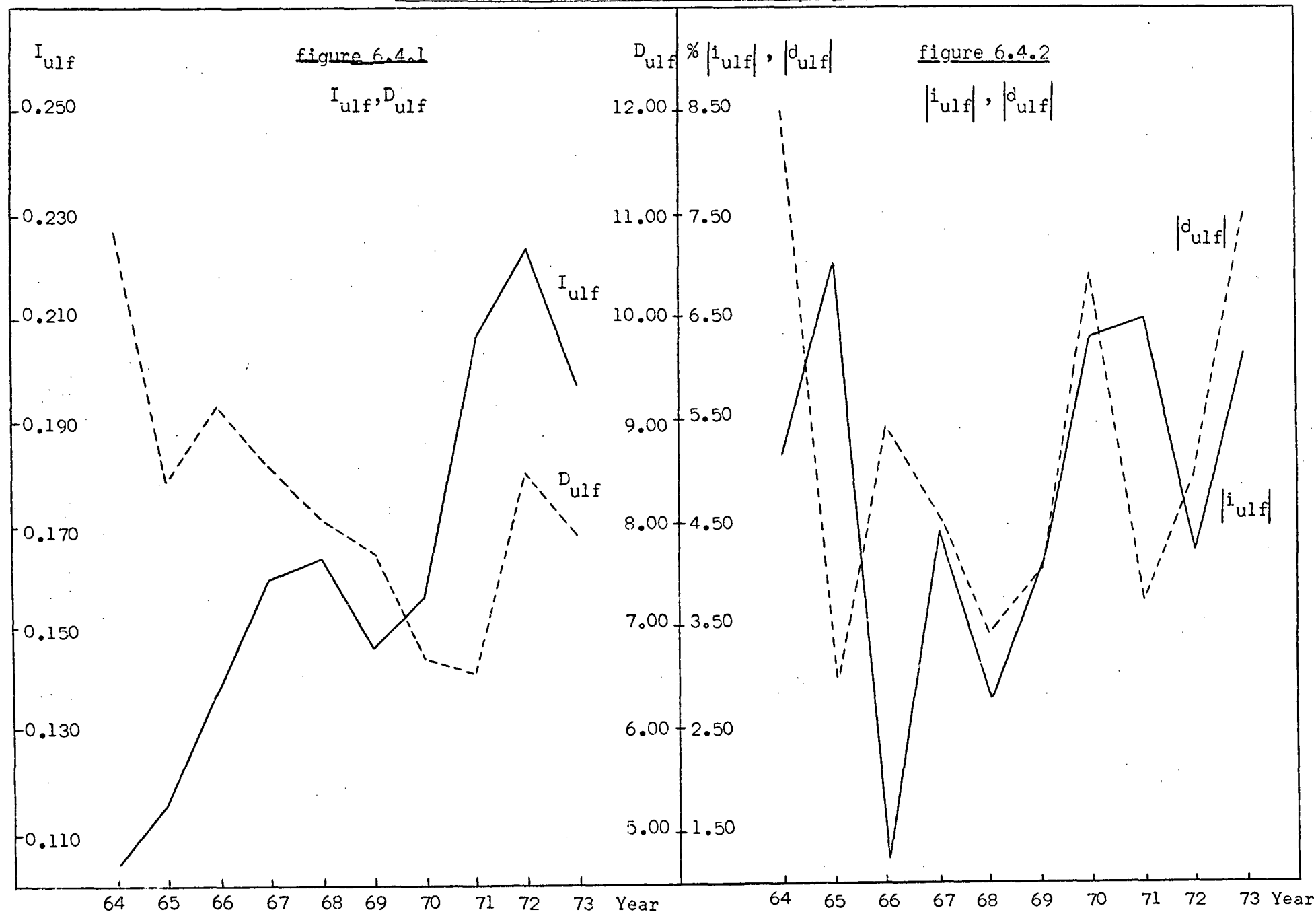
average duration of L.F.S. unemployment in the period 1964-73.

Estimated type C.4 equations for L.F.S. unemployment are presented as equations C.4.5 to C.4.8 in table 6.4.2. The fit of equations C.4.5 and C.4.6 is poor as they do not allow for the observed downward trend in the duration of unemployment. The inclusion of shift and slope dummy variables and t' improves the fit of the equation. In equation C.4.8 the coefficients on both v and \dot{v} are significant; of the shift and slope dummy variables, only the coefficient on $D_4 v$ is significantly different from zero - the duration of unemployment became less sensitive to v as from 1972_j; the coefficient on t' is negative and significant.

It is apparent that the changes in the behaviour of the incidence and duration of L.F.S. unemployment are similar in general terms to those observed with respect to C.E.S. unemployment : there has been an increase in incidence, and decrease in duration, of unemployment in the period 1964-73.

Annual averages of I_{ulf} and D_{ulf} are presented graphically in figure 6.4.1. The incidence of L.F.S. unemployment increased steadily throughout the period : in 1964, 1969 and 1973, years of relatively consistent demand-deficient unemployment, the value of I_{ulf} was 0.104, 0.146 and 0.197 respectively. The downward trend in the duration of L.F.S. unemployment is apparent : in 1964, 1969 and 1973 the value of D_{ulf} was 10.86, 7.75 and 7.90 respectively. Variations in I_{ulf} and D_{ulf} , $|i_{ulf}|$ and $|d_{ulf}|$, are depicted in figure 6.4.2. Variations in the incidence and duration of unemployment contributed fairly equally to changes in the unemployment percentage : variations in D_{ulf} accounted for 53 per cent of the variation in u_{lf} for the period 1964-73.

Incidence and Duration of L.F.S. Unemployment



It is possible to explore the behaviour of the duration of L.F.S. unemployment further by examining the behaviour of the proportion of total unemployed persons in each unemployment category (as outlined in 4.7.2). The testing equations have been labelled types C.5 and C.6 and the estimated equations are presented in table 6.4.3.

Table 6.4.3

Type C.5 and C.6 Equations.
(Duration Category Equations)

Equation No.	E Q U A T I O N	\bar{R}_2^2 D.W.S.
C.5.1	$D_{u1} = 0.314 - 0.061u_{1f} - 0.000\dot{u}_{1f} - 0.050D_2 - 0.045D_4 + 0.003t'$ (10.999)(3.135) ^f (0.098) ^{1f} (3.038) ² (2.393) ⁴ (3.829)	0.434 1.665
C.5.2	$D_{u2} = 0.314 - 0.057u_{1f} + 0.001\dot{u}_{1f} + 0.013D_2 - 0.029D_4 + 0.003t'$ (10.975)(2.961) ^f (1.267) ^{1f} (0.785) ² (1.528) ⁴ (3.019)	0.584 1.935
C.5.3	$D_{u3} = 0.236 + 0.035u_{1f} + 0.002\dot{u}_{1f} + 0.074D_2 + 0.052D_4 - 0.002t'$ (7.524)(1.648) ^f (2.229) ^{1f} (4.048) ² (2.538) ⁴ (2.345)	0.572 2.166
C.5.4	$D_{u4} = 0.137 + 0.083u_{1f} - 0.002\dot{u}_{1f} - 0.037D_2 + 0.021D_4 - 0.004t'$ (4.433)(3.972) ^f (3.358) ^{1f} (2.041) ² (1.048) ⁴ (3.959)	0.798 1.601
C.6.1	$D_{u1} = 0.156 + 0.076v - 0.001\dot{v} - 0.028D_2 - 0.066D_4 + 0.002t'$ (7.188) (3.764) (1.088) (1.708) ² (3.935) ⁴ (2.843)	0.486 1.928
C.6.2	$D_{u2} = 0.191 + 0.042v - 0.000\dot{v} + 0.018D_2 - 0.058D_4 + 0.002t'$ (7.812) (1.842) (0.741) (0.984) ² (3.058) ⁴ (2.470)	0.522 1.861
C.6.3	$D_{u3} = 0.337 - 0.052v - 0.001\dot{v} + 0.061D_2 + 0.071D_4 - 0.002t'$ (13.304) (2.203) (1.622) (3.122) ² (3.635) ⁴ (1.832)	0.562 1.967
C.6.4	$D_{u4} = 0.316 - 0.066v + 0.002\dot{v} - 0.051D_2 + 0.053D_4 - 0.003t'$ (11.990) (2.687) (3.139) (2.506) ² (2.579) ⁴ (2.868)	0.767 2.014

Equations C.5.1 and C.6.1 refer to D_{u1} : the proportion of unemployed persons who have been unemployed for a period of less than two weeks (i.e. very short-term unemployment). With respect to C.5.1, the coefficient on u_{1f} is negative and significant suggesting that D_{u1} increases as unemployment decreases; the coefficient on \dot{u}_{1f} is not significantly different from zero; the coefficients on both D_2 and D_4 are negative

and significant; the significantly positive coefficient on t' indicates an increase over time in D_{u1} , but this increase is partially offset by the shifts in 1967 and 1972. Only 43 per cent of the variation in D_{u1} is explained, but the D.W.S. of 1.665 suggests that first order serial correlation is not present in the residuals.. Equation C.6.1 displays a pattern similar to C.5.1 with negative shifts in 1967 and 1972 (an insignificant shift in 1967) and a positive time trend. The value of D_{u1} in 1964, 1969 and 1973 was 0.210, 0.253 and 0.230 respectively. The results demonstrate that the proportion of very short term unemployed in total unemployment is sensitive to u_{1f} , in the opposite direction, and has increased over time, particularly in the early part of 1964-73.

Equations C.5.2 and C.6.2 relate to D_{u2} : the proportion of unemployed persons who have been unemployed for two weeks or over and less than four weeks (short-term unemployment). In equation C.5.2 the coefficient on u_{1f} is again negative and significant indicating that D_{u2} increases as unemployment decreases; the coefficient on \dot{u}_{1f} is not significantly different from zero; the coefficients on both shift dummy variables are not significant; the coefficient on t' is positive and significant suggesting a gradual increase over time in D_{u2} . The equation explains 58 per cent of the variation in D_{u2} and the D.W.S. of 1.935 is above the upper limit of the critical region. The results for C.6.2 are similar with the exception that the coefficient on v is not significantly different from zero at the 5% level and the coefficient on D_4 is negative and significant. The value of D_{u2} in 1964, 1969 and 1973 was 0.214, 0.292 and 0.288 respectively. The results show that the proportion of short term unemployment in total unemployment is inversely related to u_{1f} and has increased over time, particularly in the period 1964-67.

Equations C.5.3 and C.6.3 relate to D_{u3} : the proportion of total

unemployed persons who have been unemployed four weeks or over and under thirteen weeks (medium term unemployment). In equation C.5.3 the coefficient on u_{1f} is positive, but not significant at the 5% level; the coefficient on \dot{u}_{1f} is positive and significant indicating that D_{u3} increases more than proportionately with unemployment; the coefficients on both shift dummy variables are positive and significant suggesting increases in medium term unemployment in both 1967 and 1972; the coefficient on t' is negative and significant. The equation explains 57 per cent of the variation in D_{u3} and the D.W.S. is above the upper limit of the critical region. The results for equation C.6.3 are similar except that the coefficient on v is significant and that on t' is insignificant at the 5% level. The value of D_{u3} in 1964, 1969 and 1973 was 0.291, 0.298 and 0.325 respectively. The results demonstrate that the proportion of medium term unemployment in total unemployment is not sufficiently sensitive to changes in unemployment to render the coefficient on u_{1f} significant; there is a time trend decrease in the value of D_{u3} , but this is more than offset by increases in 1967 and 1972.

Equations C.5.4 and C.6.4 relate to long-term unemployment, D_{u4} : persons who have been unemployed for a period of thirteen weeks or more. In equation C.5.4 the coefficient on u_{1f} is positive and significant, indicating that D_{u4} increases as u_{1f} increases; the coefficient on \dot{u}_{1f} is negative and significant implying that D_{u4} changes less than proportionately to unemployment; the coefficient on D_2 is significant and indicates a decrease in D_{u4} as from 1967_j; the coefficient on D_4 is not significantly different from zero; the coefficient on t' is significantly negative and suggests a gradual decline in D_{u4} in the period 1964-73. The equation explains 80 per

cent of the variation in D_{u4} . The results for C.6.4 are similar with the exception that the coefficient on D_4 is positive and significant. The results show that the proportion of long-term unemployed in total unemployment is sensitive, in the same direction, to u_{lf} ; the value of D_{u4} decreased over time and this movement was reinforced by a downward shift in 1967. The value of D_{u4} in 1964, 1969 and 1973 was 0.284, 0.157 and 0.156 respectively.

In the period 1964-73, decreases in the proportion of long-term unemployment in total unemployment were offset by increases in very short and short-term unemployment and, to a lesser extent, medium term unemployment. These changes have been reflected in the previously observed increase in the incidence of unemployment, relative to the duration of unemployment, with respect to the nature of L.F.S. unemployment. A similar change, in kind if not in magnitude, was observed with respect to C.E.S. unemployment.

6.5 Incidence and Duration of Unfilled Vacancies.

The estimated type D.1 equations for unfilled vacancies are presented in table 6.5.1. In equation D.1.1 the coefficient on v is positive and significant indicating that I_v , as expected, moves in the same direction as v . In D.1.2 the coefficient on \dot{v} is significantly positive suggesting that as the unfilled vacancies percentage increases or decreases the incidence of unfilled vacancies changes in the same direction at a greater rate.

The inclusion of shift and slope dummy variables, equation D.1.4, leads to an improvement in fit : \bar{R}^2 equals 0.884; D.W.S. equals 1.419. The coefficients on v and \dot{v} are positive and significant; the coefficients on all four shift and slope dummy variables

Table 6.5.1

Type D.1 and D.2 Equations : Unfilled Vacancies.

(Incidence Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
D.1.1	$I_v = 0.214 + 0.063v$ (10.534) (2.833)	0.153	0.239
D.1.2	$I_v = 0.221 + 0.053v + 0.002\dot{v}$ (14.192) (3.118) (5.280)	0.504	0.346
D.1.3	$I_v = 0.188 + 0.068v + 0.002\dot{v} + 0.001D_2 + 0.029D_4 + 0.001t'$ (18.603) (7.118) (6.790) (0.120) ² (3.700) ⁴ (1.888)	0.880	1.330
D.1.4	$I_v = 0.159 + 0.096v + 0.002\dot{v} + 0.045D_2 - 0.053D_2v + 0.007D_4 + 0.022D_4v + 0.001t'$ (7.203) (4.609) (7.135) (1.744) ² (1.786) ² (0.341) ⁴ (0.948) ⁴ (2.344)	0.884	1.419
D.2.1	$I_v = 0.234 + 0.028u_r$ (10.446) (1.658) ^r	0.043	0.331
D.2.2	$I_v = 0.234 + 0.028u_r - 0.002\dot{u}_r$ (11.845) (1.877) ^r (3.427) ^r	0.254	0.509
D.2.3	$I_v = 0.313 - 0.053u_r - 0.002\dot{u}_r - 0.016D_2 + 0.059D_4 + 0.001t'$ (20.503) (4.255) ^r (3.738) ^r (1.389) ² (4.585) ⁴ (2.028)	0.766	1.223
D.2.4	$I_v = 0.357 - 0.091u_r - 0.002\dot{u}_r - 0.110D_2 + 0.075D_2u_r + 0.160D_4 - 0.071D_4u_r + 0.002t'$ (14.156) (4.021) ^r (4.487) ^r (2.875) ² (2.685) ² ^r (3.294) ⁴ (2.527) ⁴ ^r (2.422)	0.816	1.469

Table 6.5.2

Type D.3 and D.4 Equations : Unfilled Vacancies.

(Duration Equations)

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
D.3.1	$D_v = 0.773 + 2.847v$ (3.176) (10.673)	0.743	0.232
D.3.2	$D_v = 0.691 + 2.951v - 0.021\dot{v}$ (3.435) (13.435) (4.437)	0.828	0.382
D.3.3	$D_v = 1.182 + 2.701v - 0.015\dot{v} - 0.126D_2 - 0.351D_4 - 0.007t'$ (8.273) (20.152) (4.845) (1.150) ² (3.176) ⁴ (1.146)	0.950	1.232
D.3.4	$D_v = 1.422 + 2.474v - 0.016\dot{v} - 0.738D_2 + 0.742D_2v + 0.191D_4 - 0.618D_4v - 0.008t'$ (4.647) (8.585) (5.263) (2.054) ² (1.809) ² (0.645) ⁴ (1.884) ⁴ (1.422)	0.953	1.319
D.4.1	$D_v = 5.707 - 1.836u_r$ (18.365) (7.382) ^r	0.511	0.345
D.4.2	$D_v = 5.706 - 1.836u_r + 0.009\dot{u}_r$ (18.348) (7.876) ^r (0.972) ^r	0.610	0.339
D.4.3	$D_v = 6.490 - 2.306u_r + 0.018\dot{u}_r - 0.614D_2 + 0.797D_4 + 0.004t'$ (23.580) (10.515) ^r (2.327) ^r (3.052) ² (3.473) ⁴ (0.398)	0.844	1.419
D.4.4	$D_v = 6.222 - 2.025u_r + 0.022\dot{u}_r - 0.596D_2 + 0.026D_2u_r + 3.447D_4 - 1.552D_4u_r - 0.005t'$ (13.650) (4.920) ^r (2.833) ^r (0.858) ² (0.169) ² ^r (3.926) ⁴ (3.064) ⁴ ^r (0.455)	0.873	1.975

are insignificant at the 5% level - there is an indication of an increase in the constant term and decrease in the coefficient on v in 1967, but not a sufficient change to render the coefficients on D_2 and D_2v significant; the coefficient on t' is positive and significant suggesting that the dominant change in the behaviour of the incidence of unfilled vacancies was a gradual increase over time in the period 1964-73 (a total time trend increase of approximately 0.040).

Estimated type D.2 equations for unfilled vacancies are presented as equations D.2.1 to D.2.4 in table 6.5.1. In D.2.1 the coefficient on u_r is not significant and only 4 per cent of the variation in I_v is explained; the inclusion of \dot{u}_r as an explanatory variable results in some improvement in fit and the negative coefficient on \dot{u}_r is significant. Both shift and slope dummy variables are included in D.2.4 and \bar{R}^2 increases to 0.816. The coefficients on all variables are significantly different from zero; the change indicated in 1967 is largely offset by the change in 1972 and these changes reflect the previously observed changes in the behaviour of u_r relative to v ; the coefficient on t' is positive and this confirms the increase over time in the incidence of unfilled vacancies.

The estimated D.3 equations relating to the duration of unfilled vacancies are presented in table 6.5.2. In equation D.5.1 the coefficient on v is positive and highly significant and 74 per cent of the variation in D_v is explained. The inclusion of \dot{v} as an independent variable improves the fit of the equation and the coefficient is negative, as is necessary to offset the positive coefficient on \dot{v} for I_v . Both shift and slope dummy variables are included in D.3.4 and \bar{R}^2 increases to 0.953. The coefficient on D_2 is negative and significant indicating a decrease in the value of D_v as from 1967; there is

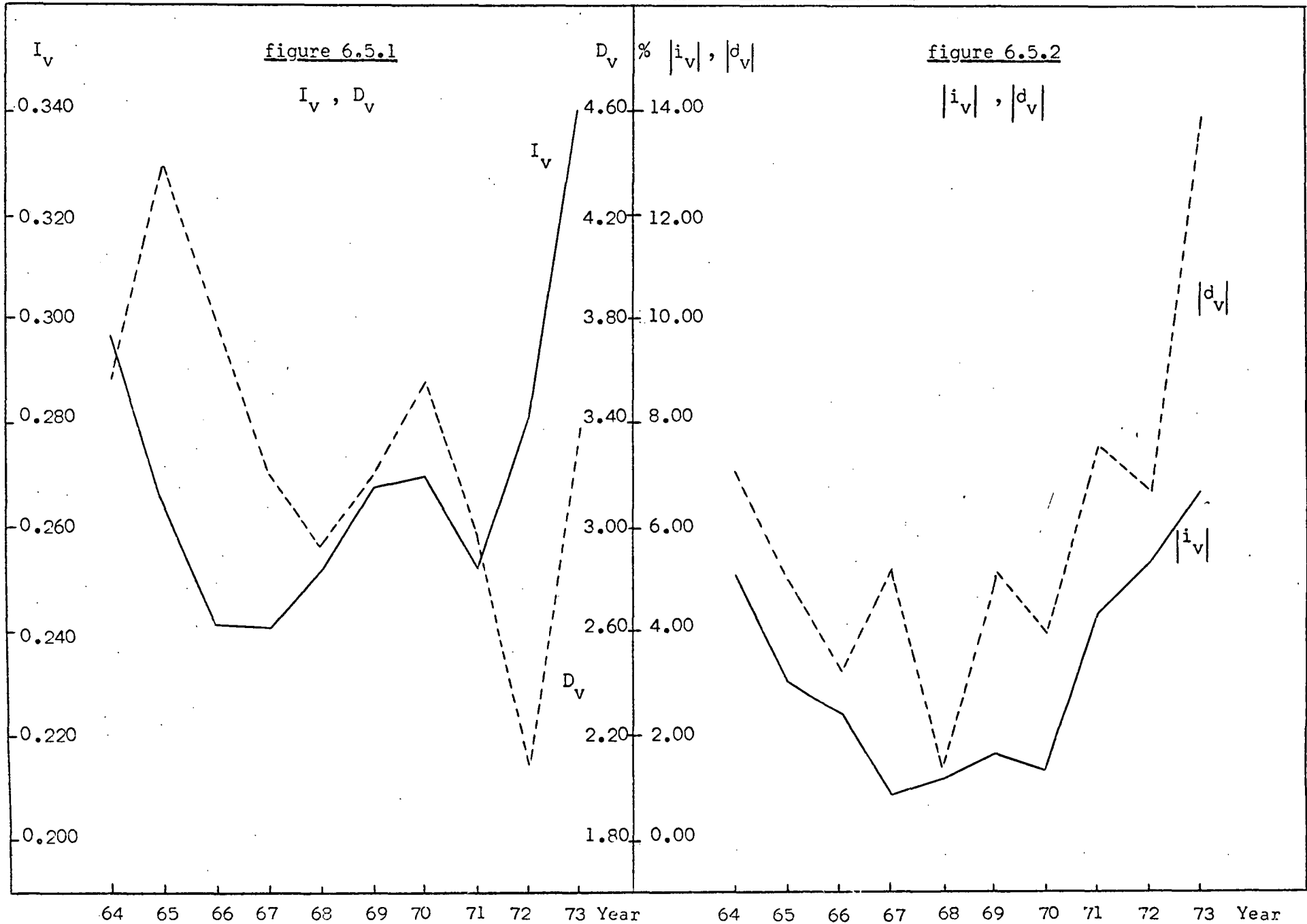
an indication of an increase in the sensitivity of D_v to v in 1967, but the coefficient on D_2v is marginally insignificant; a similar marginally insignificant offsetting change is evident in 1972; the coefficients on D_4 and t' are not significantly non-zero. The only significant change in the behaviour of D_v is, thus, a downward shift in its value as from 1967_s.

Estimated type D.4 equations are presented as equations D.4.1 to D.4.4 in table 6.5.2. The coefficient on u_r is negative and significant and the equation explains 61 per cent of the variation in D_v ; the inclusion of \bar{u}_r does not improve the fit of the equation. The inclusion of shift and slope dummy variables improves the fit of the equation with a \bar{R}^2 for D.4.4 of 0.873; the coefficients on D_4 and D_4v are significant and reflect an increase in the constant term and in sensitivity to u_r as from 1972_j.

Annual averages of I_v and D_v are depicted graphically in figure 6.5.1. The tendency for I_v to increase over time is evident as is the decrease in the value of D_v as from 1967; both I_v and D_v increased rapidly in 1973. One noteworthy feature of figure 6.5.1 is that the incidence of unfilled vacancies, the flow of vacancies notified, was higher in 1972 than in the period of high demand for labour in 1969-70.. This meant that as the demand for labour increased in 1973 the rapid increase in the unfilled vacancies percentage was accentuated by the already high incidence of unfilled vacancies.

Figure 6.5.2 graphically depicts the annual averages of i_v and d_v . The sensitivity of D_v to the demand for labour, as measured by d_v is greater than that for I_v in all years and for the period 1964-73 variations in D_v account for approximately 65 per cent of the variation in the unfilled vacancies percentage.

Incidence and Duration of Unfilled Vacancies

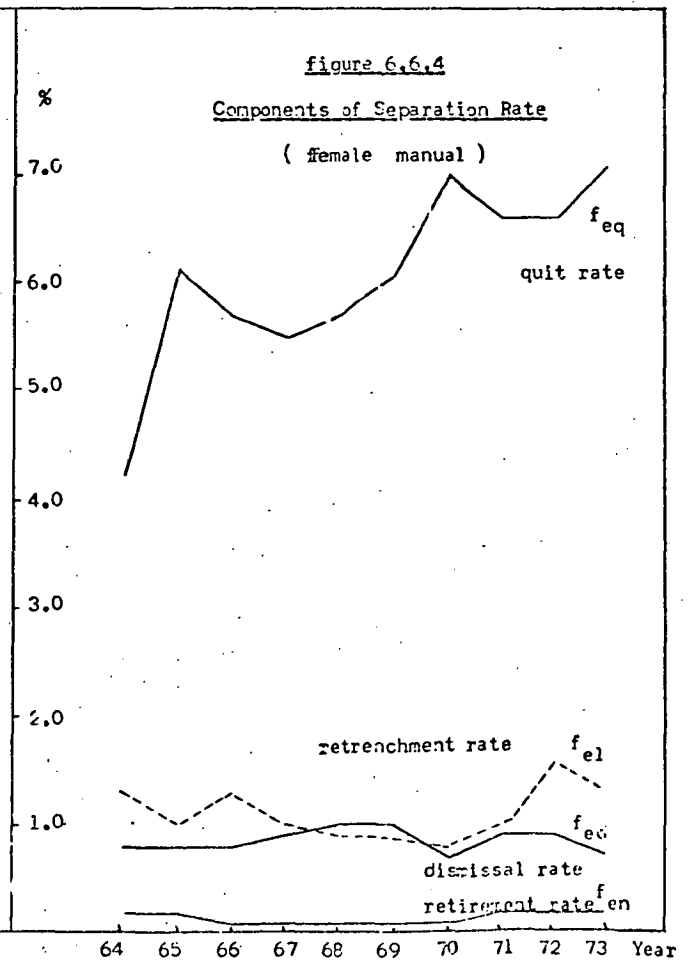
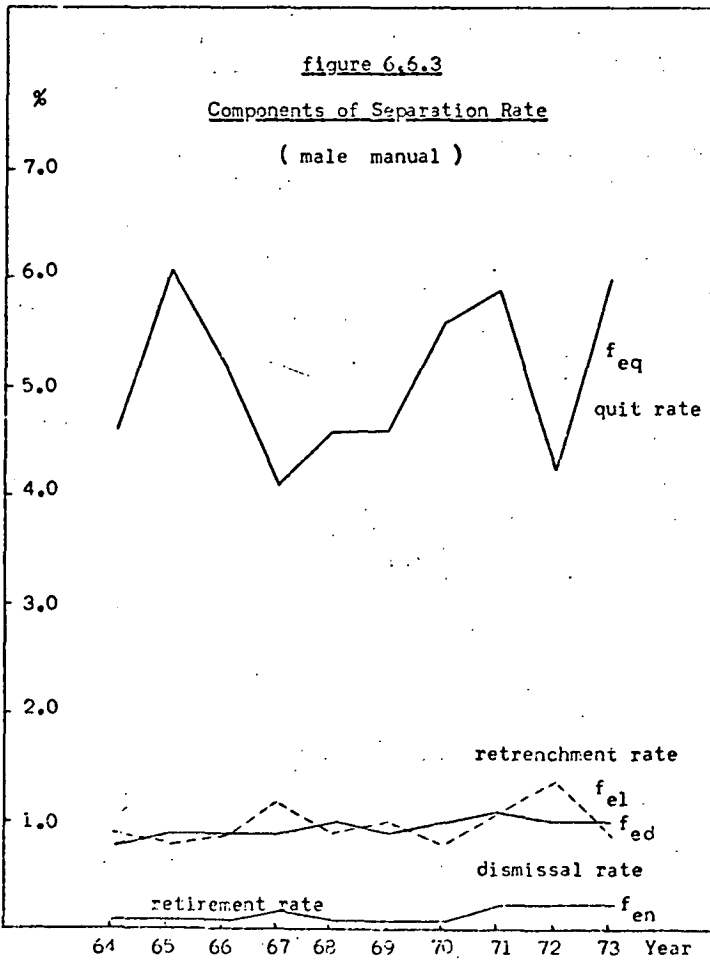
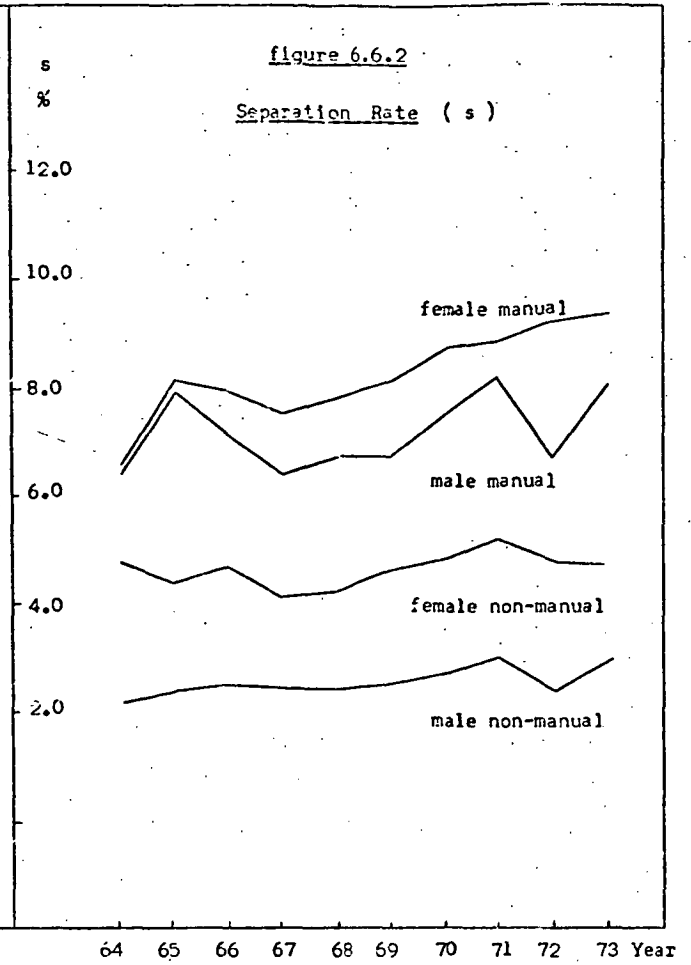
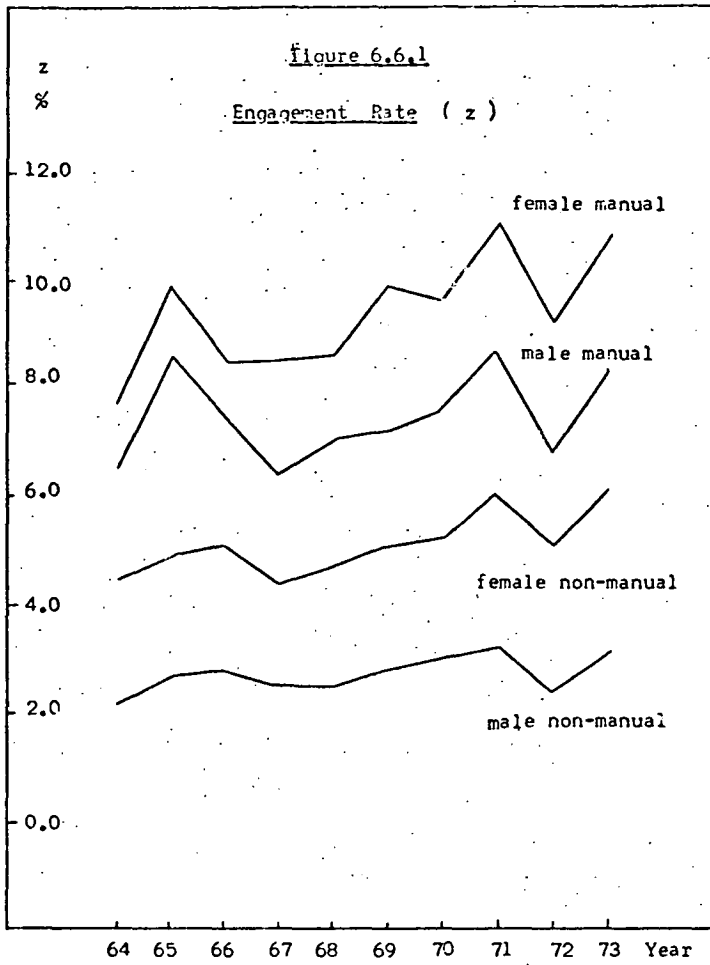


The results of this section may be briefly summarised as indicating an increase in the incidence of unfilled vacancies, I_v , in the period 1964-73 and a decrease in the duration of unfilled vacancies, D_v , as from 1967..

6.6 Turnover in the Labour Force.

In section 6.3 it was observed that the incidence of C.E.S. unemployment increased during the period 1964-73 and became more sensitive to changes in the demand for labour as from 1967. The results of section 6.4 indicated an increase in the incidence of L.F.S. unemployment over time. Similarly, an increase in the incidence of unfilled vacancies for the period 1964-73 is suggested by the results of section 6.5 and the tendency for the incidence of unfilled vacancies to remain high as the demand for labour decreased in 1971-72 was noted. These changes would seem to imply a change in the turnover behaviour of members of the labour force : that is, assuming the proportion of persons in the turnover flow who experience unemployment remains the same, an increase in the incidence of unemployment reflects an increase in labour turnover; assuming the proportion of jobs in the total flow of jobs that results in unfilled vacancies remains constant, an increase in the incidence of unfilled vacancies will similarly reflect an increase in labour turnover. This section analyses data on labour turnover to observe whether such a change did take place in the period 1964-73.

Data on the engagement rate, (the flow of persons into employment expressed as a percentage of average employment) as at February-March each year, for four categories of workers are depicted graphically in figure 6.6.1. The engagement rate is higher for manual workers



than for non-manual workers, and for females than for males. A tendency for the engagement rate to increase over time, particularly for female workers, is evident. For the years 1964, 1969 and 1973, years of like demand-deficient unemployment, the engagement rate for male non-manual workers increased from 2.2 to 2.8 and to 3.1 per cent; for male manual workers from 6.5 to 7.2 and to 8.3 per cent; for female non-manual workers from 4.5 to 5.1 and to 6.1 per cent; and for female manual workers from 7.7 to 9.9 and to 10.8 per cent.

Data on the separation rate (departures from employment expressed as a percentage of average employment) for the four categories of workers are presented in figure 6.6.2 and the general tendency to increase over time is again evident. For male non-manual workers the separation rate was 2.2 per cent in 1964, 2.5 in 1969 and 2.9 in 1973: a steady increase over time. The main increase for male manual workers occurred between 1967 and 1973 : 6.4 per cent in 1964, 6.7 in 1969 and 8.0 in 1973. The separation rate of 8.0 per cent for male manual workers in 1973 represents a high level of labour turnover - almost 100 per cent per annum. There was little change in the separation rate for female non-manual workers in the 1964-73 period. For female manual workers the separation rate increased markedly : from 6.5 per cent in 1964, to 8.1 per cent in 1969 and to 9.3 per cent (112 per cent per annum) in 1973.

A breakdown of the separation rate for manual workers is presented in figures 6.6.3 (males) and 6.6.4 (females). The dominant component of the total separation rate is the quit rate (voluntary separations as a percentage of average employment) : for males quits accounted for 72 per cent of total separations in 1964, 69 per cent in 1969 and 75 per cent in 1973; for females quits accounted for

65 per cent of separations in 1964, 75 per cent in 1969 and 76 per cent in 1973. Retrenchments and dismissals account for a similar proportion of total separations, retrenchments being more sensitive than dismissals to the demand for labour. Retirements from the labour force are a fairly constant and low percentage of average employment. Although retrenchments are low compared with quits, the relative impact of retrenchments on the flow of unemployed persons through the labour market will be more substantial given the likelihood that a large proportion of retrenched persons will experience unemployment compared with a small proportion of those who quit their jobs.

With respect to male manual workers, no substantial changes in the behaviour of retrenchments, dismissals and retirements in the period 1964-73 are evident, apart from a slight tendency to increase over time. The quit rate for male manual workers reached a maximum for the period 1964-73 of 6.1 per cent in 1965, decreased to 4.6 per cent in 1967 and then increased to 6.0 per cent in 1973. The relatively low quit rate in the period 1967-72 would seem to be a plausible partial explanation for the observed shift of the unemployment-vacancy relationship in 1967; the high level of quits relative to the unemployment percentage in 1973 would appear to be a causal factor of the observed 1972 shift.

With respect to female manual workers no significant changes in the behaviour of the retirement, dismissal and retrenchment rates are evident apart from a tendency for the retrenchment rate to remain at a level of 1.3 per cent as demand increased in 1973. The quit rate for female manual workers displays an apparent upward trend, particularly in the period 1967-70. The female quit rate was 4.2 per cent in 1964, increased to 7.0 per cent in 1970, remained as high as 6.6

per cent in 1972 and then increased to 7.1 per cent in 1973. The tendency to remain high in 1972 would help explain the fact that the incidence of unfilled vacancies remained relatively high in the 1971-72 period. The strong upward trend in the female manual quit rate is a plausible explanatory factor in the shift of the unemployment-vacancy relationship in 1972.

The data presented in this section, although limited in scope and in the number of observations, indicate that changes in labour turnover are at least partially responsible for the observed shifts in the unemployment-vacancy relationship. A tendency for labour turnover, in particular the quit rate, to increase in the period 1964-73 is evident and this is reflected in the increases observed with respect to the incidence of unemployment and unfilled vacancies. The data also suggest that a high level of labour turnover is a characteristic of the Australian labour market. Additional data relative to labour turnover are analysed in the following section.

6.7 Surveys of Labour Force Experience

In the period 1964-73 the Australian Bureau of Statistics undertook two surveys of labour force experience, firstly in 1968 and then in 1972. The 1968 survey included data on the number of periods of unemployment experienced by unemployed persons. Almost 74 per cent experienced only one period of unemployment (69 per cent for males, 80 per cent for females); 11 per cent had two periods of unemployment in the year (males - 12 per cent; females - 10 per cent); 15 per cent experienced three or more periods of unemployment. Assuming an average of 3.5 spells of unemployment, the group of those experiencing three or more periods of unemployment would account for 35

per cent of the total spells of unemployment; the group of two periods of unemployment would account for a further 15 per cent of the total spells of unemployment. That is, 26 per cent of unemployed persons would have accounted for 50 per cent of unemployment spells in 1968. The identification of, and provision of stable employment for, those who experience multiple spells of unemployment would exert a downward force on the unemployment percentage largely independent of the demand for labour. That is, non demand-deficient unemployment could be reduced by the implementation of appropriate manpower programmes.

In 1968 7.5 per cent of persons in the labour force experienced unemployment during the year (males - 6.3 per cent, females - 9.8 per cent). In 1972, a year of higher unemployment than 1968, the proportion of persons in the labour force who experienced unemployment increased to 10.0 per cent (males - 8.6 per cent, females - 12.5 per cent).

The surveys also provided data on the duration of unemployment - for some this would be the duration of completed spells of unemployment and the data are not comparable with earlier data on the duration of current unemployment. In 1968, 18 per cent of those unemployed had an unemployment duration of less than two weeks, 26 per cent of two weeks or more and less than four weeks, 40 per cent of four weeks or more and less than thirteen weeks, and 15 per cent of thirteen weeks and over. Assuming the same average duration within categories as in section 4.7.2, the average duration of unemployment would be 8.3 weeks. In 1972, 19 per cent of the unemployed had an unemployment duration of less than two weeks, 24 per cent of two weeks or more and less than four weeks, 28 per cent of four weeks or more and less than thirteen weeks, and 19 per cent of thirteen weeks or more. This means an average duration of unemployment of 9.0 weeks, slightly higher than in 1968.

The unemployed who experience an unemployment duration of four weeks or more contribute disproportionately to the average duration of unemployment. For example, in 1968 those unemployed thirteen weeks or more represented 15 per cent of the unemployed, but contributed 50 per cent of the average duration of unemployment; those unemployed for four weeks or more and under thirteen weeks represented 40 per cent of the unemployed and contributed 38 per cent to the average duration of unemployment; this means that the remaining 45 per cent of the unemployed contributed only 12 per cent of the average duration of unemployment. In 1972, those unemployed less than four weeks represented 43 per cent of the unemployed but contributed only 10 per cent to the average duration of unemployment.

The above analysis indicates that one means of reducing the unemployment percentage, and consequently non demand-deficient unemployment, would be to identify at an early stage those persons expected to experience an extended period of unemployment and implement policies aimed specifically at the provision of stable employment for these persons.

The A.B.S. also conducted a survey on "Labour Mobility" in November, 1972. This survey provided data on the number of jobs held by members of the labour force in the previous twelve months and the duration of current jobs for employed persons. The results showed that 82 per cent of the labour force held only one job in the previous twelve months, a further 13 per cent held only two jobs and 4 per cent had three jobs or more. These data suggest that a large majority of Australian workers are in stable employment and in any particular year, including years characterised by a low demand for labour, would not enter the turnover flow and even less so the flow of unemployed persons.

The data relating to the duration of current employment supports this conclusion : the duration of current employment for 75 per cent of employed persons is one year or more and for 38 per cent of employment it is five years or more. This means that a small proportion of the labour force contribute disproportionately to labour turnover and to the flow of unemployed persons. The identification of this group and the implementation of relevant policies would assist in reducing the incidence of unemployment and the level of non demand-deficient unemployment.

6.8 Output-Unemployment Relationship.

The position of the u-v relationship is dependent in part on aggregate supply and demand variables. The objective of this section and the two following sections is to determine whether changes in these factors have taken place. Such changes would be reflected by variations in the relationship between the aggregate demand for goods and services and the levels of unemployment and unfilled vacancies. Table 6.8.1 presents estimates of type E.1 and E.2 equations.¹

Table 6.8.1

Equation No.	<u>Type E.1 and E.2 Equations</u> (Output - Unemployment)						\bar{R}^2	D.W.S.			
	E	Q	U	A	T	I O N					
E.1.1	\dot{u}_r	=	9.411 (4.728)	-	6.422y _{nf} (6.177)	-	0.142D ₂ (0.084) ²	-	2.904D ₄ (1.364) ⁴	0.503	1.129
E.1.2	\dot{u}_{lf}	=	5.924 (2.479)	-	3.721y _{nf} (2.981)	-	0.110D ₂ (0.054) ²	-	2.815D ₄ (1.102) ⁴	0.170	1.270
E.2.1	\dot{v}	=	-9.619 (3.202)	+	6.539y _{nf} (4.167)	+	0.045D ₂ (0.018) ²	+	7.230D ₄ (2.251) ⁴	0.361	1.278

1. See section 3.7 ; y_{nf} is a proxy variable for the demand for goods and services.

In equation E.1.1 the coefficient on y_{nf} is significantly negative indicating an inverse relationship between changes in the unemployment percentage and the demand for goods and services; the \bar{R}^2 statistic shows that 50 per cent of the variation in \dot{u} is accounted for; the coefficients on both dummy variables are non-significantly different from zero. The results for equation E.1.2 are similar to those for E.1.1 with a significantly negative coefficient on y_{nf} and non-significant coefficients for both D_2 and D_4 . The results indicate that there was no change in the output-unemployment relationship coinciding with the observed shifts in the unemployment-vacancy relationship.

In equation E.2.1 the coefficient on y_{nf} is significantly different from zero and suggests a positive relation between the demand for goods and services and unfilled vacancies, as expected; the equation explains 36 per cent of the variation in \dot{v} and the D.W.S. is in the critical region for which the test for positive first order serial correlation is indeterminate; the coefficient on D_4 is significantly positive and this implies that as from the June quarter of 1972 smaller increases in y_{nf} than previously will give rise to increases in the unfilled vacancies percentage. That is, increases in y_{nf} have a greater impact with respect to increasing the value of v . The shift is a substantial one in that the constant term increases from -9.619 to -2.389 as from the June quarter of 1972.

The results presented in this section show that, although no change in the output-unemployment relation has been observed, there was a shift in the output-unfilled vacancies relation in 1972.

6.9 Supply of Labour.

The objective of this section is to ascertain whether there has

been a change in the relation between changes in the labour force and the unemployment or unfilled vacancies percentage. Table 6.9.1 presents estimated type E.3 and E.4 equations¹ (see section 3.7.1).

Table 6.9.1

Equation No.	<u>Type E.3 and E.4 Equations</u> (Supply of Labour)						\bar{R}^2	D.W.S.
	E	Q	U	A	T	I O N		
E.3.1	1	=	1.037-0.320u _r +0.003u _r -0.011D ₂ +0.224D ₄				-0.006	1.284
			(4.816)(1.777)	(0.664)	(0.140)	(1.727) ⁴		
E.3.2	1	=	1.022-0.250u _{lf} +0.008u _{lf} -0.012D ₂ +0.218D ₄				0.004	1.165
			(4.003)(1.436)	(1.534)	(0.161)	(1.655) ⁴		
E.4.1	1	=	0.329 +0.337v-0.008v̇ + 0.017D ₂ +0.093D ₄				0.079	1.057
			(1.701)(1.824)(1.976)	(0.214)	(0.969) ⁴			

The estimated type E.3 equations perform very unsatisfactorily and suggest that there is no relation between the labour force and unemployment, although the coefficient on u_r in E.3.1 is only marginally non-significant; the values for the D.W.S. are also relatively high and this indicates that the rate of change in the labour force may be fairly constant through time (the coefficient on the constant term is significantly different from zero for both E.3.1 and E.3.2); there is a suggestion of an increase in l as from 1972_j, but the coefficients on D₄ are marginally non-significant. Equation E.4.1 explains 8 per cent of the variation in l; the coefficients on the constant term and v are significantly different from zero at the 10% level of significance and the coefficient on v̇ at the 5% level; the coefficients on both dummy variables are not significantly different from zero.

The general conclusion, albeit tentative, from these results is that the shifts in the unemployment-vacancy relationship are not reflected in the relation between the supply of labour and unemploy-

ment or unfilled vacancies. This overall stability in the supply of labour may result from offsetting changes in the behaviour of population and the participation rate. This possibility is considered below.

Estimated type E.5 and E.6 equations are presented in table 6.9.2 as a basis for determining whether changes in the growth of the population of working age took place in the period 1964-73.

Table 6.9.2

Equation No.	<u>Type E.5 and E.6 Equations</u> (Population)						\bar{R}^2	D.W.S.
	E	Q	U	A	T	I O N		
E.5.1	$p = 0.603 - 0.056u_r - 0.003\dot{u}_r + 0.028D_2 - 0.110D_4$ (5.017)(0.553)(1.199) ^r (0.653) ² (1.519) ⁴						0.087	1.731
E.5.2	$p = 0.557 - 0.012u_{1f} - 0.000\dot{u}_{1f} + 0.019D_2 - 0.116D_4$ (3.775)(0.120) ^{1f} (0.112) ^{1f} (0.427) ² (1.524) ⁴						0.033	1.691
E.6.1	$p = 0.435 + 0.104v - 0.002\dot{v} + 0.035D_2 - 0.113D_4$ (3.835) (0.955) (0.895) (0.744) ² (2.016) ⁴						0.075	1.710

The estimated equations perform unsatisfactorily in terms of \bar{R}^2 ; the values for the D.W.S. indicate that first order serial correlation is not present. For equations E.5.1 and E.5.2 only the coefficients on the constant term are significantly different from zero; the coefficient on D_4 is negative in both equations and this suggests a decrease in p as from 1972_j, albeit a statistically non-significant decrease. In equation E.6.1 the coefficient on D_4 is negative and significant and this confirms the possibility of a decrease in p . Such a decline in the rate of growth of the population would, other things being equal, reduce the flow of persons into the labour force and, thus, the incidence of unemployment. This would cause a shift of the unemployment-vacancy relationship towards the origin, reducing the level of non demand-deficient

unemployment in the labour market.

To test for changes in the behaviour of the participation rate estimated type E.7 and E.8 equations are presented in table 6.9.3.

Table 6.9.3

Equation No.	<u>Type E.7 and E.8 Equations</u> (Participation Rate)					\bar{R}^2	D.W.S.
	E	Q	U	A	T I O N		
E.7.1	a	=	0.440 - 0.282u _{1f} + 0.008u _{1f} ² - 0.016D ₄ + 0.345D ₄ ²			0.104	1.243
			(2.117)	(1.626)	(1.678)	(0.218)	(2.758)
E.7.2	a	=	0.429 - 0.223u _{1f} + 0.011u _{1f} ² - 0.012D ₄ + 0.329D ₄ ²			0.109	1.200
			(1.738)	(1.327)	(1.986)	(0.161)	(2.582)
E.8.1	a	=	-0.176 + 0.283v - 0.009v ² + 0.011D ₄ + 0.225D ₄ ²			0.171	1.110
			(0.937)	(1.605)	(2.377)	(0.141)	(2.423)

The estimated equations in table 6.9.3 are unsatisfactory with respect to both \bar{R}^2 and D.W.S. In equation E.7.1 only the coefficients on the constant term and D₄ are significantly different from zero and only 10 per cent of the variation in "a" is explained. For equation E.7.1 the coefficients on u_{1f} and D₄ are significant and for equation E.8.1 the coefficients on v and D₄ are significantly different from zero. The coefficient on D₄ is consistently positive and significant and this indicates that there was an increase in the participation rate, over and above the time trend increase, as from 1972_j.

The results presented in this section relating to the supply of labour are generally unsatisfactory, but the following tentative conclusions have been arrived at. Firstly, changes in the supply of labour, l, were not a significant cause of the shift in the unemployment-vacancy relationship, although there was an indication of an increase in l as from 1972_j. Such an increase would, other things being equal, contribute to the observed shift in the u-v relation at that

time. Secondly, the results give a suggestion of a decrease in the rate of growth of population of working age as from 1972_j, a change which would tend to reduce the level of non demand-deficient unemployment. Thirdly, since the coefficients on D_4 in the E.3 and E.4 equations are positive, any decreases in the rate of growth in the population of working age in 1972 was more than offset by an increase in the participation rate. That is, although not a dominant causal factor, changes in the supply of labour may have contributed to the increase in non demand-deficient unemployment observed in 1972.

6.10 Demand for Labour.

The objective of this section is to determine whether changes in the determinants of the demand for labour contributed to the observed shifts in the unemployment-vacancy relationship. The first step is the estimation of type E.9 and E.10 equations as outlined in section 3.7.2. The estimated equations are presented in table 6.10.1.

Table 6.10.1

Equation No.	<u>Type E.9 and E.10 Equations</u> (Demand for Labour)					\bar{R}^2 D.W.S.
	E	Q	U	A	T I O N	
E.9.1	e^*	$= 1.154 - 0.429u_x - 0.017\ddot{u}_x + 0.005D_2 + 0.339D_4$				0.441 1.421
					$(6.312)(2.808)^x(3.758)^r(0.070)^2(3.074)^4$	
E.9.2	e^*	$= 0.962 - 0.206u_{1f} - 0.017\ddot{u}_{1f} - 0.022D_2 + 0.252D_4$				0.296 1.127
					$(3.934)(1.235)^f(3.260)^{1f}(0.301)^2(1.998)^4$	
E.10.1	e^*	$= 0.217 + 0.440v + 0.009\ddot{v} + 0.039D_2 + 0.087D_4$				0.257 1.156
					$(1.097)(2.330)(2.387)(0.484)(0.885)^4$	

In equation E.9.1 the coefficients on all variables except D_2 are significantly different from zero and 44 per cent of the

variation in e^* is explained; the positive coefficient on D_4 suggests that there was an increase in the rate of change of the demand for labour in the period 1972_j to 1973_d, but this change would in part reflect the outward shift of the $u-v$ relationship. The results for E.9.2 are similar to those for E.9.1 with the exception that the coefficient on u_{1f} is not significantly different from zero; the coefficient on D_2 is not significant while that on D_4 is significantly positive. The results for equation E.10.1 indicate that there was no change in the relationship between the rate of change in the demand for labour and the unfilled vacancies percentage.

The demand for labour is the sum of employment and unfilled vacancies. The behaviour of employment is considered on the basis of type E.11 and E.12 equations as presented in table 6.10.2.

Table 6.10.2

Equation No.	<u>Type E.11 & E.12 Equations</u> (Employment)						\bar{R}^2 D.W.S.
	E	Q	U	A	T	I O N	
E.11.1	e	=	1.162-0.436u _r -0.008i _r +0.005D ₂ +0.288D ₄				0.215 1.341
			(5.986)(2.689)	(1.694)	r	(0.079) ² (2.465) ⁴	
E.11.2	e	=	1.038-0.262u _{1f} -0.009i _{1f} -0.009D ₂ +0.220D ₄				0.099 1.157
			(4.191)(1.552)	f	(1.609)	1f (0.122) ² (1.726) ⁴	
E.12.1	e	=	0.189 + 0.467v+0.000v̇ + 0.044D ₂ +0.070D ₄				0.099 1.014
			(0.969) (2.507)(0.115)			(0.543) ² (0.723) ⁴	

The estimated equations are poor fitting, particularly with respect to \bar{R}^2 . In equation E.11.1 only 21 per cent of the variation in "e" is explained; the coefficient on D_4 is significantly positive, suggesting an increase in e relative to u_r (this change may reflect a non-linear portion of the relation rather than a shift thereof : increases in the demand for labour may have a greater impact on unem-

ployment in periods of high unemployment than in periods of low unemployment). In equation E.11.2 the coefficients on all variables are non-significantly different from zero; the coefficient on D_4 is again positive, but marginally non-significant at the 5% level. In general, the results suggest that increases in the demand for goods and services in the period 1972_j to 1973_d had an impact on unemployment equal to or greater than in earlier periods.

In equation E.12.1 only the coefficient on v is significantly different from zero and there is no indication of a change in the relationship between employment and unfilled vacancies in either 1967 or 1972. That is, increases in unfilled vacancies in the 1972-73 period were in accord with movements in employment in that time.: increases in the demand for labour were reflected by similar changes in both unfilled vacancies and employment.

The relationship between the demand for labour and the demand for goods and services is affected by the behaviour of the productivity of persons employed. Estimated type E.13 and E.14 equations relate to the productivity of employed persons and these equations are presented in table 6.10.3.

Table 6.10.3

Equation No.	Type E.13 and E.14 Equations (Labour Productivity)						\bar{R}^2 D.W.S.
	E	Q	U	A	T	I O N	
E.13.1	q	= -0.281 + 0.853u ₁ - 0.069u ₂ - 0.157D ₂ - 0.627D ₄					0.299 2.011
		(0.437)	(1.587) ^r	(4.426) ^r	(0.694) ²	(1.617) ⁴	
E.13.2	q	= 0.448 + 0.193u _{1f} - 0.041u _{2f} - 0.159D ₂ - 0.175D ₄					0.017 1.556
		(0.493)	(0.312) ^{1f}	(2.058) ^{1f}	(0.582) ²	(0.374) ⁴	
E.14.1	q	= 1.854 - 1.142v + 0.048v̇ - 0.321D ₂ - 0.235D ₄					0.281 1.877
		(3.035)	(1.953)	(3.989)	(1.274) ²	(0.775) ⁴	

The most significant variable in the equations in table 6.10.3 is the rate of change of either unemployment or unfilled vacancies : the productivity of persons employed increases as the demand for labour increases (unemployment falls, unfilled vacancies rise). The coefficients on both D_2 and D_4 are negative, but not significantly different from zero, in the three equations. That is, no significant change in the behaviour of the productivity of labour employed took place in either 1967 or 1972; any change that did occur was in the direction of reduced productivity and such a change would tend to reduce the level of unemployment (an higher employment level would be required for a given demand for goods and services). Productivity changes may, thus, have been a minor causal factor in the 1967 reduction in the level of non demand-deficient unemployment, but would not have contributed to the increase therein in 1972.

CHAPTER 7

SECTORS OF THE LABOUR FORCE.

7.1 Introduction.

As outlined in section 1.5, a change in the position of the aggregate unemployment-vacancy relationship may be the result of a redistribution of demand between sectors, a change in the relative importance of sectors in the labour force or changes in the sectoral unemployment-vacancy relationships. The objective of this chapter is to determine which of these factors are responsible for the observed shifts in the aggregate unemployment-vacancy relationship. The method to be used is, firstly, to estimate sectoral unemployment-vacancy relationships and test these relationships for positional changes and, secondly, to analyse the structure of unemployment by sector to examine the nature of changes that occurred in the period 1964-73.

Section 2 is a preliminary section which estimates the aggregate unemployment-vacancy relationship in absolute terms and tests for positional changes. Section 3 involves the estimation of unemployment-vacancy relationships for age-sex sectors (adult males, junior males, adult females, junior females); the section also analyses the share of each sector in the total pool of unemployment and unfilled vacancies. Section 4 contains an analysis of the structure of unemployment by age-sex characteristics for the period 1964-73 based on Labour Force Survey data.

Sections 5 and 6 relate to geographical sectors : States, with N.S.W., Victoria and Queensland divided into metropolitan and non-

metropolitan. The analysis of the structure of unemployment for geographical sectors is restricted by limitations associated with the scope of L.F.S. data.

Occupational unemployment-vacancy relationships are estimated in section 7 and an analysis of the structure of unemployment by occupation is presented in section 8. A different occupational breakdown is employed for each section since the classifications used by the C.E.S. and the L.F.S. are at variance one with the other. C.E.S. data on unemployment by industry are not available and the analysis of industrial sectors is restricted to the structure of unfilled vacancies and L.F.S. unemployment. This analysis is presented in section 9.

The term "position of balance" will be used throughout the chapter and refers to a situation in which a sector's share of unemployment is approximately equal to its share of unfilled vacancies. As illustrated in section 1.5, given log-linear u_i-v_i relationships and assuming equal size sectors and equal elasticity of u_i with respect to v_i , a movement away from a position of balance (caused by a redistribution of demand between sectors) will generally be associated with an outward movement of the aggregate $u-v$ curve and an increase in non demand-deficient unemployment. Although the above conditions will not normally pertain, a more even distribution of demand between sectors (as reflected in smaller differences between sectors' shares of unemployment and unfilled vacancies) will reduce the level of non demand-deficient unemployment in the labour market.

7.2 Aggregate Unemployment - Vacancy Relationship.

Estimated U-V relationships for the aggregate labour market are presented in table 7.2.1. The testing of the unemployment-vacancy

Table 7.2.1

Type F.1 and F.2 Equations : Aggregate U-V Relationship.

Equation No.	E Q U A T I O N					\bar{R}^2	D.W.S.
F.1.1	$U_r = 70424 - 0.608V + 1231t'$ (9.281) (3.819) (8.947)					0.690	0.189
F.1.2	$U_r = 89182 - 0.896V - 9617D_2 + 25622D_4 + 1029t'$ (21.277) (10.475) (2.757) ² (8.029) ⁴ (5.822)					0.922	1.344
F.1.3	$U_r = 98555 - 1.039V - 0.231D_2V + 0.607D_4V + 968t'$ (23.122) (13.355) (4.324) ² (12.830) ⁴ (7.664)					0.960	1.836
F.1.4	$U_r = 98993 - 1.109V + 5733D_2 - 0.393D_2V - 13253D_4 + 0.867D_4V + 1046t'$ (12.310) (6.661) (0.613) ² (1.856) ² (1.898) ² (5.933) ⁴ (8.041)					0.961	1.757
F.1.5	$\bar{U}_r = 15.908 - 0.483\bar{V} + 0.017t'$ (15.614) (5.067) (10.030)					0.758	0.181
F.1.6	$\bar{U}_r = 17.470 - 0.623\bar{V} - 0.137D_2 + 0.274D_4 + 0.016t'$ (26.722) (10.196) (2.602) ² (5.740) ⁴ (6.001)					0.912	0.842
F.1.7	$\bar{U}_r = 17.520 - 0.627\bar{V} - 0.012D_2\bar{V} + 0.027D_4\bar{V} + 0.015t'$ (27.784) (10.661) (2.535) ² (6.099) ⁴ (5.923)					0.916	0.870
F.1.8	$\bar{U}_r = 21.999 - 1.043\bar{V} - 1.085D_2 + 0.087D_2\bar{V} - 6.146D_4 + 0.602D_4\bar{V} + 0.015t'$ (24.354) (12.346) (0.977) ² (0.832) ² (8.199) ⁴ (8.590) ⁴ (10.449)					0.978	1.957

relationship in absolute terms is necessary to enable direct comparison with subsequent sectoral unemployment-vacancy relationships for which only absolute data are available.

With respect to the linear equations, there is little difference in goodness of fit as between equations F.1.3 and F.1.4. In F.1.3 the coefficients on both dummy variables are significantly different from zero and show an increase in absolute slope in 1967 which is more than offset by a subsequent decrease in 1972. In equation F.1.4 the coefficient on D_4V is significantly different from zero at the 5% level while the coefficients on both D_2V and D_4 are marginally insignificant. Generally it can be concluded that the linear results suggest that the absolute slope of the U-V relationship increased in 1967; in 1972 the constant term increased and the absolute slope decreased.

Equations F.1.5 to F.1.8 relate to testing the log-linear form of the U-V relationship. Equation F.1.8 includes both shift and slope dummy variables and is the best fitting equation. The coefficients on both 1967 dummy variables are not significant, suggesting that the change at that time indicated by the linear equations is the result of the non-linear form of the relationship; the coefficients on both D_4 and $D_4\bar{V}$ are significantly different from zero and suggest that as from 1972, the U - V relationship became more elastic with an associated increase in the level of non demand-deficient unemployment.

Since earlier results have shown that a change in the level of non demand-deficient unemployment occurred in 1967, dummy variables for both 1967 and 1972 will be included in the sectoral equations in following sections. Although the change in the U - V relationship in 1967 is not significant, offsetting changes may have occurred in

particular sectors of the labour force.

7.3 Age - Sex Sectors : Unemployment - Vacancy Relationships.

7.3.1 Adult Males.

Time series for the period 1964-73 for U_{dam} and V_{dam} are presented in figure 7.3.1. Strong inverse parallelism between the two series is evident throughout the period; the points of intersection between U_{dam} and V_{dam} are at approximately the same level of U_{dam} in 1964-65 and 1969-70, but at a much higher level in 1973.

Estimated equations for adult males are presented in table 7.3.1. The inclusion of dummy variables improves the fit of the linear equations with \bar{R}^2 increasing from 0.639 in G.1.1 to 0.961 in G.1.4; the coefficients on all dummy variables are significant with an increase in absolute slope in 1967 being more than offset by a subsequent decrease in 1972. The fit of the log-linear equations is also improved by the inclusion of dummy variables, but the coefficients on the 1967 dummy variables are not significantly different from zero. The best fitting equation is G.1.8 and the results for this equation show a large decrease in the elasticity of U_{dam} with respect to V_{dam} as from 1972. This confirms the observation from the graph that there was an increase in the level of non demand-deficient unemployment for adult males in 1972.

Figure 7.3.2 graphically portrays the sector's share of total unemployment (j_{dam}) and of total unfilled vacancies (k_{dam}). The gap between j_{dam} and k_{dam} narrowed in the early part of the period and remained small up to 1970 and this trend would have acted to reduce the level of non demand-deficient unemployment in the labour market. The expansion of demand in 1973 resulted in k_{dam} exceeding

ADULT MALES

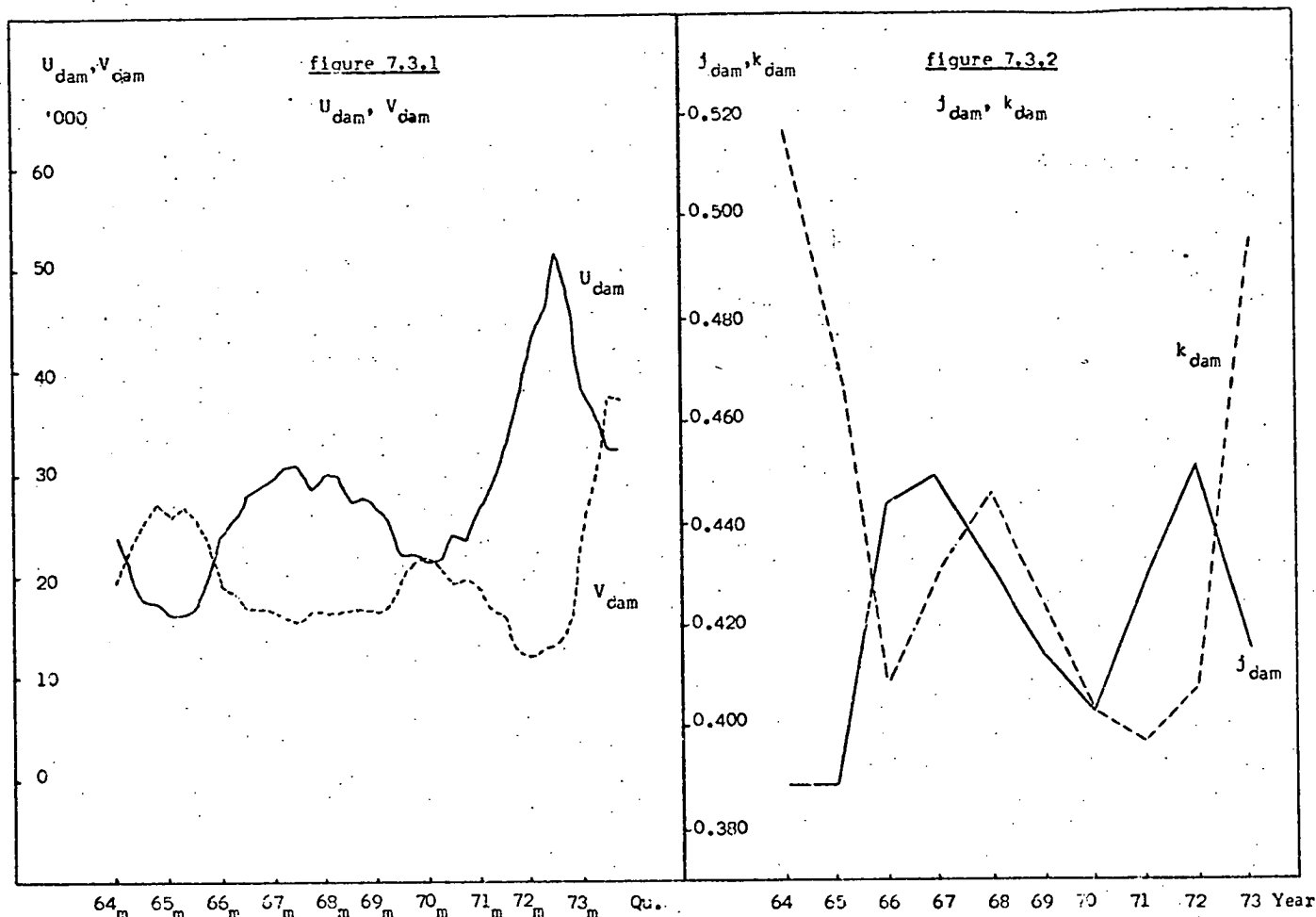


Table 7.3.1

G.1 Equations : Adult Males.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
G.1.1	$U_{dam} = 29907 - 0.573V_{dam} + 509t'$ (9.332) (4.134) (7.318)	0.639	0.174
G.1.2	$U_{dam} = 40661 - 0.934V_{dam} - 3739D_2 + 14331D_4 + 325t'$ (19.816) (11.254) (2.523) (7.952) (3.433)	0.897	1.182
G.1.3	$U_{dam} = 49064 - 1.294V_{dam} - 0.246D_2V_{dam} + 0.811D_4V_{dam} + 250t'$ (20.335) (13.473) (3.901) (12.877) (3.493)	0.949	1.642
G.1.4	$U_{dam} = 43993 - 1.063V_{dam} + 12831D_2 - 0.895D_2V_{dam} - 7783D_4 + 1.246D_4V_{dam} + 232t'$ (16.074) (9.090) (3.647) (4.829) (2.526) (7.746) (3.733)	0.961	1.877
G.1.5	$\bar{U}_{dam} = 14.780 - 0.496\bar{V}_{dam} + 0.017t'$ (16.305) (5.430) (7.943)	0.722	0.157
G.1.6	$\bar{U}_{dam} = 16.786 - 0.688\bar{V}_{dam} - 0.101D_2 + 0.387D_4 + 0.011t'$ (26.829) (11.008) (1.572) (6.134) (3.367)	0.890	0.744
G.1.7	$\bar{U}_{dam} = 17.010 - 0.710\bar{V}_{dam} - 0.009D_2\bar{V}_{dam} + 0.042D_4\bar{V}_{dam} + 0.010t'$ (27.781) (11.635) (1.379) (6.672) (3.041)	0.899	0.799
G.1.8	$\bar{U}_{dam} = 20.894 - 1.105\bar{V}_{dam} + 0.344D_2 - 0.042D_2\bar{V}_{dam} - 0.889D_4 + 0.748D_4\bar{V}_{dam} + 0.004t'$ (32.391) (17.107) (0.392) (0.468) (9.316) (9.886) (2.327)	0.978	1.976

j_{dam} : the restoration of an imbalance in the labour market that was evident in 1964-65.

7.3.2 Junior Males.

Time series on U_{djm} and V_{djm} are graphically depicted in figure 7.3.3. The two series intersected in the early part of the period and for the years 1964, 1965 and 1966 V_{djm} was greater than U_{djm} . The series came close to intersecting each other in 1969-70, but a significant gap is evident in 1973. The unemployment series clearly shows an upward trend while the unfilled vacancies series decreases over time. The inverse parallelism is not as regular and consistent as for adult males.

Estimated unemployment - vacancy relationships for junior males are presented as equations G.2.1 to G.2.8 in table 7.3.2. Equation G.2.4 is the best fitting linear equation and performs better than the comparable log-linear equation. Of the dummy variables in G.2.4 only the coefficient on D_2V_{djm} is significantly different from zero. This significance would seem to derive from a non-linear portion of the relationship since the inclusion of dummy variables in the log-linear equations only marginally improves the goodness of fit and the coefficients on all dummy variables tested are insignificant. The coefficient on t' is significant in G.2.4 and its magnitude (374) is greater than that for adult males (238). Since the junior male labour force is considerably less than that for adult males this clearly demonstrates an increasing unemployment percentage for junior males in the period 1964-73. That is, there was an upward trend in unemployment amongst junior males of greater magnitude than that to be expected from the growth of the junior male labour force.

JUNIOR MALES

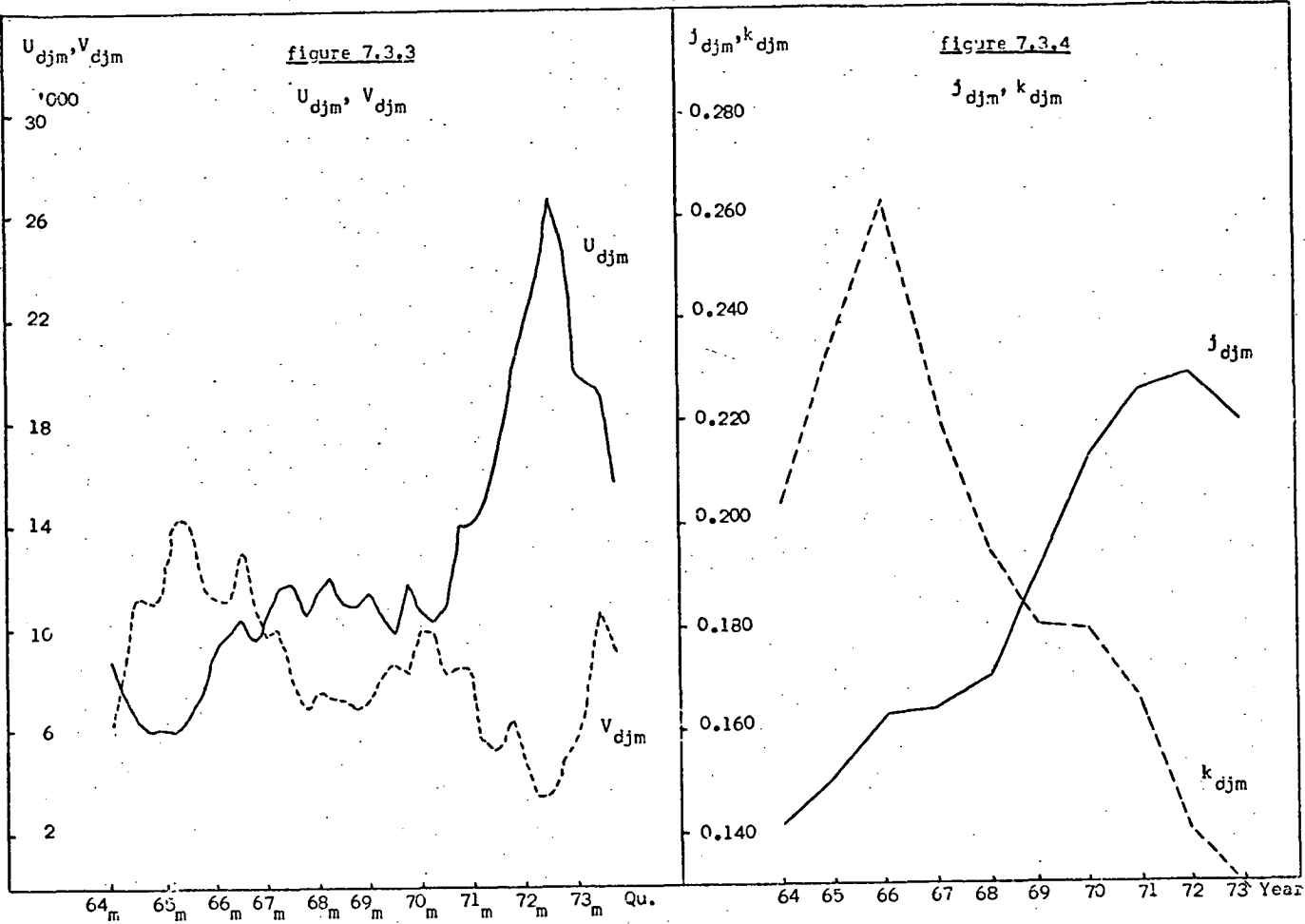


Table 7.3.2

G.2 Equations : Junior Males.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
G.2.1	$U_{djm} = 12692 - 0.658V_{djm} + 300t'$ (5.681) (3.562) (7.051)	0.790	0.500
G.2.2	$U_{djm} = 18583 - 0.952V_{djm} - 5215D_2 + 2305D_4 + 386t'$ (9.537) (6.422) (3.906) ² (2.032) ⁴ (6.298)	0.893	1.399
G.2.3	$U_{djm} = 13425 - 0.688V_{djm} - 0.647D_2V_{djm} + 0.169D_4V_{djm} + 422t'$ (8.138) (5.297) (6.400) ² (1.246) ⁴ (8.599)	0.910	1.736
G.2.4	$U_{djm} = 10847 - 0.436V_{djm} + 2654D_2 - 0.767D_4V_{djm} + 3480D_4 - 0.199D_4V_{djm} + 374t'$ (4.635) (2.983) (0.743) ² (2.191) ² (1.346) ⁴ (0.546) ⁴ (6.513)	0.915	1.920
G.2.5	$\bar{U}_{djm} = 12.608 - 0.408\bar{V}_{djm} + 0.023t'$ (16.876) (5.119) (10.001)	0.882	0.742
G.2.6	$\bar{U}_{djm} = 13.392 - 0.494\bar{V}_{djm} - 0.279D_2 - 0.015D_4 + 0.032t'$ (19.023) (6.512) (3.211) ² (0.189) ⁴ (7.637)	0.910	1.156
G.2.7	$\bar{U}_{djm} = 13.171 - 0.469\bar{V}_{djm} - 0.030D_2\bar{V}_{djm} - 0.002D_4\bar{V}_{djm} + 0.032t'$ (19.510) (6.478) (3.223) ² (0.174) ⁴ (7.611)	0.910	1.158
G.2.8	$\bar{U}_{djm} = 13.315 - 0.485\bar{V}_{djm} + 0.031D_2 - 0.034D_4\bar{V}_{djm} - 0.319D_4 + 0.035D_4\bar{V}_{djm} + 0.031t'$ (8.691) (2.932) (0.015) ² (0.145) ² (0.185) ⁴ (0.177) ⁴ (6.841)	0.905	1.161

The sector's shares of unemployment (j_{djm}) and of unfilled vacancies (k_{djm}) are presented in figure 7.3.4. In the years 1964 to 1969 there was a movement towards balance between j_{djm} and k_{djm} and this factor would have contributed to a decrease in the level of non demand-deficient unemployment. As from 1969 the gap between j_{djm} and k_{djm} widened as the share of unemployment increased and the share of unfilled vacancies decreased. A major and continuing change in the relative position of junior males in the labour force evidently took place in the 1964-73 period. The sector contributed to the decrease in non demand-deficient observed in 1967 and to the increase therein in 1972. These contributions were made by means of shifts along the sector's unemployment - vacancy relationship and not by shifts of the relationship itself.

7.3.3 Adult Females.

Figure 7.3.5 graphically portrays the behaviour of U_{daf} and V_{daf} in the period 1964-73. Inverse parallelism between the two series is consistently apparent. Upward trends in both unemployment and unfilled vacancies are evident, reflecting the growth of the female labour force in the period. The series did not intersect in the high labour demand period of 1964-65, but did in both 1969-71 and in 1973. Unlike most sectors, the unfilled vacancies series for adult females had its minimum in 1968 and not in the recession of 1972.

Estimated equations for adult females are presented in table 7.3.3. The inclusion of dummy variables improves the fit of the linear equations with \bar{R}^2 increasing from 0.637 for G.3.1 to 0.941 for G.3.4. In equation G.3.4 the coefficients on both 1967 dummy variables and that on the 1972 slope dummy variable are significantly different from zero; both changes are in the direction of a decrease

ADULT FEMALES

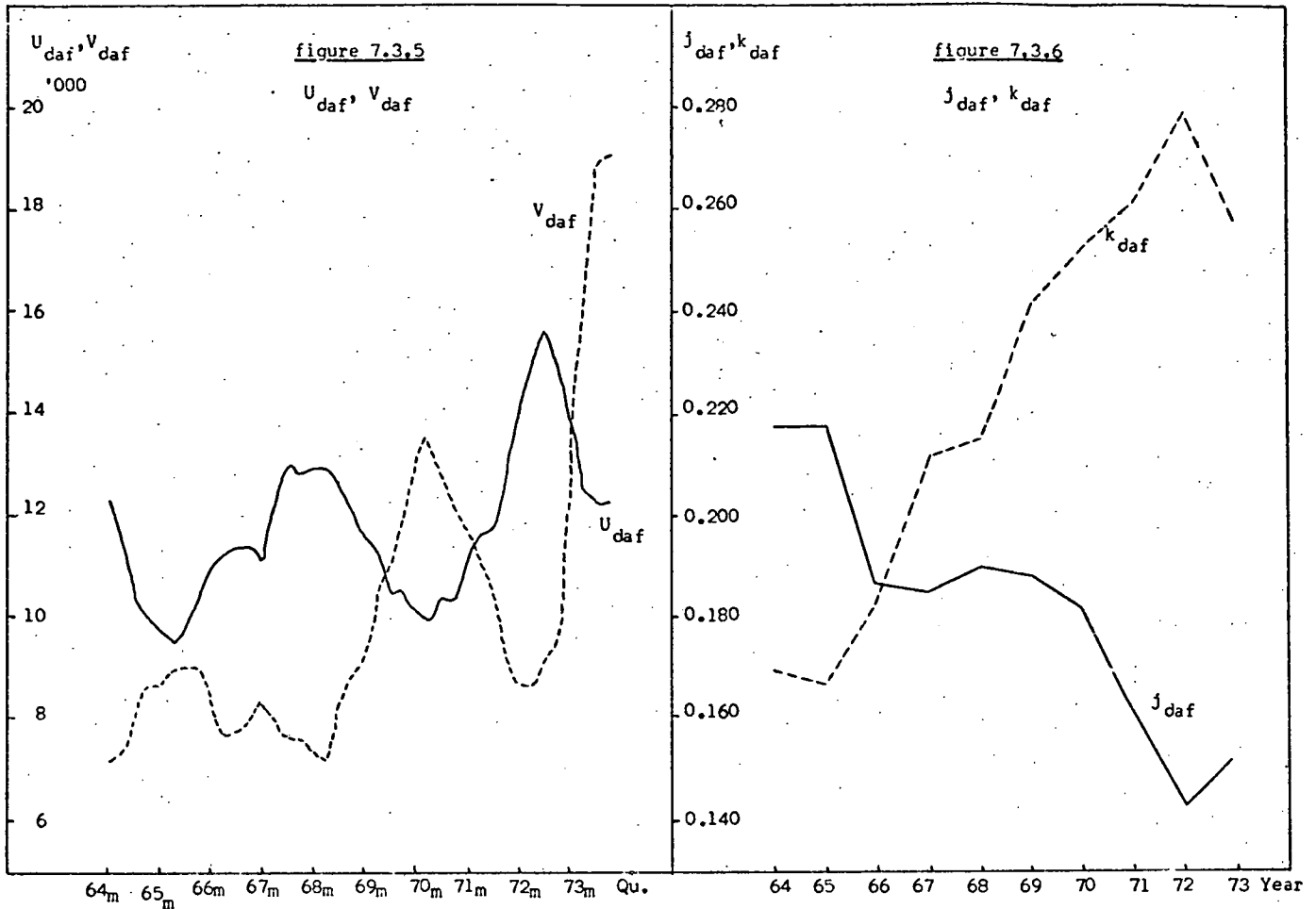


Table 7.3.3

G.3 Equations : Adult Females.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
G.3.1	$U_{daf} = 13433 - 0.441V_{daf} + 144t'$ (24.348) (6.318) $_{daf}$ (8.353)	0.637	0.265
G.3.2	$U_{daf} = 14361 - 0.479V_{daf} + 543D_2 + 2650D_4 + 74t'$ (38.129) (10.394) $_{daf}$ (1.336) (7.064) $^4_{daf}$ (3.236)	0.851	0.847
G.3.3	$U_{daf} = 16365 - 0.729V_{daf} + 0.096D_2V_{daf} + 0.237D_4V_{daf} + 78t'$ (36.080) (14.332) $_{daf}$ (2.713) $^2_{daf}$ (11.095) $^4_{daf}$ (5.057)	0.918	1.177
G.3.4	$U_{daf} = 21165 - 1.325V_{daf} - 4821D_2 + 0.649D_2V_{daf} - 1269D_4 + 0.318D_4V_{daf} + 99t'$ (15.012) (7.725) $_{daf}$ (3.250) (3.676) $^2_{daf}$ (1.741) (5.585) $^4_{daf}$ (6.547)	0.941	1.539
G.3.5	$\bar{U}_{daf} = 13.603 - 0.489\bar{V}_{daf} + 0.013t'$ (26.315) (8.411) $_{daf}$ (10.536)	0.740	0.332
G.3.6	$\bar{U}_{daf} = 13.716 - 0.497\bar{V}_{daf} + 0.033D_2 + 0.178D_4 + 0.008t'$ (38.847) (12.496) $_{daf}$ (1.107) $^2_{daf}$ (6.525) $^4_{daf}$ (4.799)	0.884	0.940
G.3.7	$\bar{U}_{daf} = 13.835 - 0.510\bar{V}_{daf} + 0.004D_2\bar{V}_{daf} + 0.019D_4\bar{V}_{daf} + 0.008t'$ (40.894) (13.407) $_{daf}$ (1.281) $^2_{daf}$ (6.918) $^4_{daf}$ (4.899)	0.991	0.986
G.3.8	$\bar{U}_{daf} = 18.330 - 1.009\bar{V}_{daf} - 3.678D_2 + 0.412D_2\bar{V}_{daf} - 2.026D_4 + 0.234D_4\bar{V}_{daf} + 0.009t'$ (18.953) (9.400) $_{daf}$ (3.640) $^2_{daf}$ (3.674) $^2_{daf}$ (4.424) $^4_{daf}$ (4.805) $^4_{daf}$ (8.052)	0.949	1.780

in the absolute slope of the relationship, with the 1967 shift being of greater magnitude than that in 1972. The log-linear equations generally perform better than the linear equations and the inclusion of dummy variables improves the goodness of fit. The best-fitting equation is G.3.8 and the results for this equation suggest a decrease in the elasticity of the relationship in both 1967 and 1972 with associated increases in non demand-deficient unemployment. The change in 1967 would have offset the change observed for junior males at that time.

The share of adult females in unemployment (j_{daf}) and in unfilled vacancies (k_{daf}) is depicted in figure 7.3.6. It is evident that the share of unemployment has decreased steadily, with minor cyclical variations to the trend, while at the same time the share of unfilled vacancies has increased. In the period 1964-66 this trend was a movement towards balance, but since 1966 the trend has generally been to a widening of the gap between j_{daf} and k_{daf} . This means that adult females contributed to increases in non demand-deficient unemployment both by shifts of and shifts along the sector's unemployment - vacancy relationship.

7.3.4 Junior Females.

Data series for U_{djf} and V_{djf} are depicted graphically in figure 7.3.7. Inverse parallelism is apparent, although there is a certain amount of irregular movement in the series. The series did not intersect in the 1964-73 series. An upward trend is evident in both series, to a greater extent with respect to unemployment,

Estimated equations for junior females are presented in table 7.3.4. The best fitting linear equation is G.4.4 with a \bar{R}^2 of 0.819, marginally better than that for the best log-linear equation. With

JUNIOR FEMALES

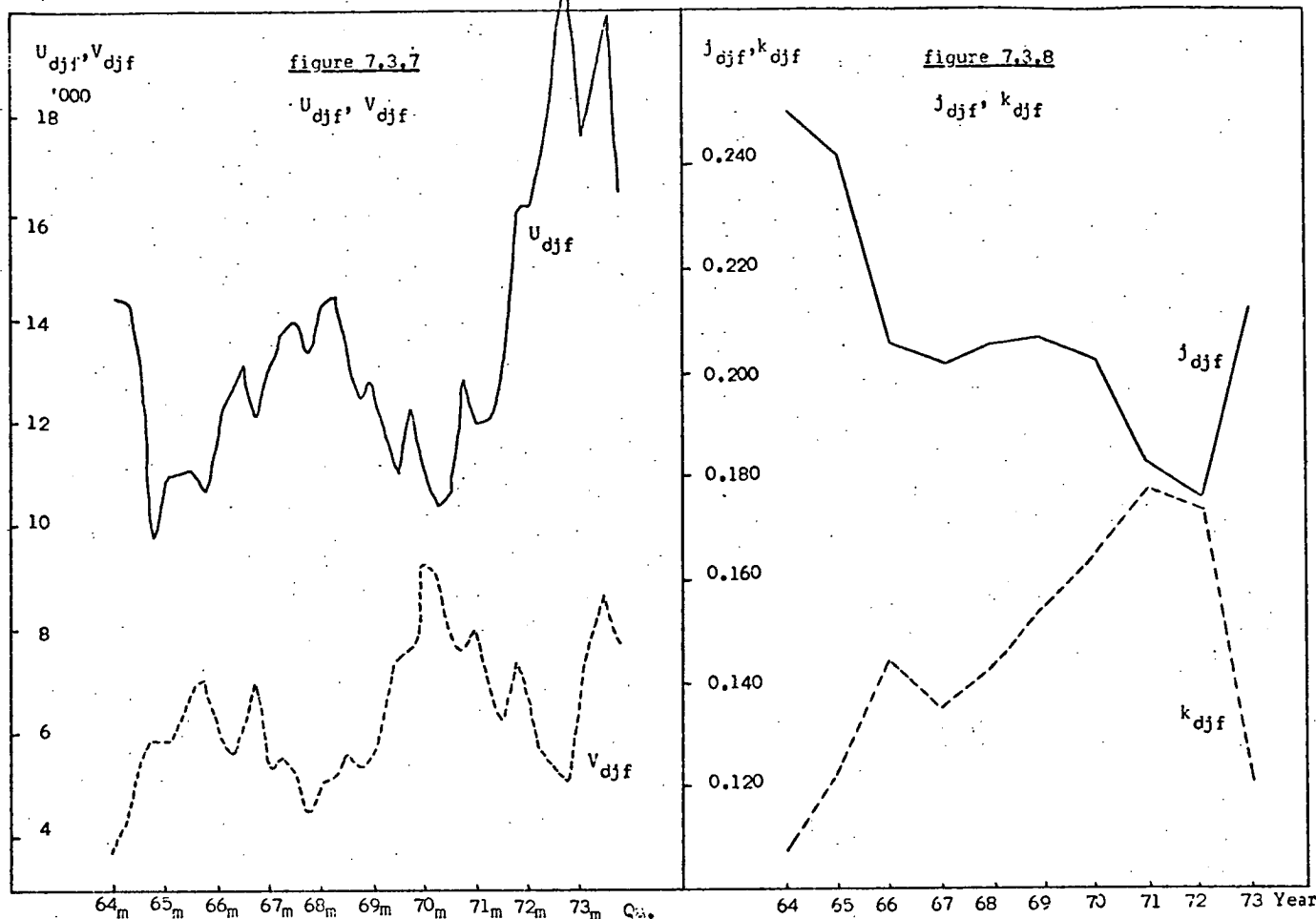


Table 7.3.4

G.4 Equations : Junior Females.

Equation No.	EQUATION	\bar{R}^2	D.W.S.
G.4.1	$U_{djf} = 17384 - 1.223V_{djf} + 213t'$ (12.468) (5.055) d_{jf} (7.837)	0.611	0.814
G.4.2	$U_{djf} = 16950 - 0.976V_{djf} - 1229D_2 + 3642D_4 + 163t'$ (16.525) (5.009) d_{jf} (1.397) ² (4.202) ⁴ (3.096)	0.806	1.794
G.4.3	$U_{djf} = 16927 - 0.964V_{djf} - 0.130D_2V_{djf} + 0.571D_4V_{djf} + 146t'$ (15.864) (5.397) d_{jf} (0.995) ² (5.126) ⁴ d_{jf} (3.235)	0.816	1.818
G.4.4	$U_{djf} = 19691 - 1.460V_{djf} - 3771D_2 + 0.414D_4V_{djf} - 586D_4 + 0.604D_4V_{djf} + 174t'$ (9.505) (4.005) d_{jf} (1.494) ² (1.036) ² d_{jf} (0.203) ⁴ (1.533) ⁴ d_{jf} (3.392)	0.819	1.939
G.4.5	$\bar{U}_{djf} = 14.377 - 0.590\bar{V}_{djf} + 0.015t'$ (16.483) (5.804) d_{jf} (8.282)	0.643	0.901
G.4.6	$\bar{U}_{djf} = 13.859 - 0.524\bar{V}_{djf} - 0.119D_2 + 0.190D_4 + 0.014t'$ (18.340) (5.892) d_{jf} (1.885) ² (3.092) ⁴ (3.763)	0.799	1.788
G.4.7	$\bar{U}_{djf} = 13.781 - 0.515\bar{V}_{djf} - 0.013D_2\bar{V}_{djf} + 0.022D_4\bar{V}_{djf} + 0.014t'$ (18.912) (6.005) d_{jf} (1.815) ² d_{jf} (3.205) ⁴ d_{jf} (3.716)	0.801	1.799
G.4.8	$\bar{U}_{djf} = 14.941 - 0.650\bar{V}_{djf} - 0.645D_2 + 0.060D_4\bar{V}_{djf} - 3.001D_4 + 0.361D_4\bar{V}_{djf} + 0.015t'$ (12.624) (4.725) d_{jf} (0.466) ² (0.374) ² d_{jf} (1.845) ⁴ (1.965) ⁴ d_{jf} (4.121)	0.814	1.982

respect to equation G.4.4 the coefficients on the dummy variables are insignificant, although equations G.4.2 and G.4.3 had indicated a significant change in 1972. The coefficients on the 1972 dummy variables in G.4.8 are marginally significant and suggest a decrease in the elasticity of U_{djf} with respect to V_{djf} as from 1972 and an associated increase in non demand-deficient unemployment; there was no change in the relationship in 1967.

The share of junior females in unemployment (j_{djf}) and in unfilled vacancies (k_{djf}) is depicted in figure 7.3.8. Apart from minor cyclical variations, j_{djf} decreased to 1972 and then increased in 1973; in the same period k_{djf} increased to 1971 and then decreased. Approximate balance was attained in 1971-72 after the large gap in 1964 had gradually narrowed through time. The expansion of demand in 1973 resulted in a movement along the sector's unemployment-vacancy relationship towards imbalance, adding to the already observed outward shift of the relationship.

7.3.5 Summary.

The preferred form of the unemployment - vacancy relationship is the log-linear equation including both shift and slope dummy variables. This form of the equation is used for the purpose of presenting comparative unemployment - vacancy relationships for age-sex sectors in table 7.3.5 below.

The coefficient on \bar{V}_1 is significantly different from zero for each of the four equations in table 7.3.5 demonstrating that there is an unemployment - vacancy relationship for each age-sex sector. The only significant shift in 1967 was for adult females and this change would tend to increase the level of non demand-deficient unemployment. In 1972 there were positional changes with respect to the

Table 7.3.5

Comparative $\bar{U}_i - \bar{V}_i$ Relationships (age-sex sectors)								
\bar{U}_i	\bar{V}_i	D_2	$D_2\bar{V}_i$	D_5	$D_5\bar{V}_i$	t'	\bar{R}^2	D.W.S.
dam	-1.105 (17.107)	0.344 (0.392)	-0.042 (0.468)	-6.889 (9.316)	0.748 (9.886)	0.004 (2.327)	0.978	1.976
djm	-0.485 (2.932)	0.031 (0.015)	-0.034 (0.145)	-0.319 (0.185)	0.035 (0.177)	0.031 (6.841)	0.905	1.161
daf	-1.009 (9.400)	-3.678 (3.640)	0.412 (3.674)	-2.026 (4.424)	0.234 (4.805)	0.009 (8.052)	0.949	1.780
djf	-0.650 (4.725)	-0.645 (0.466)	0.060 (0.374)	-3.001 (1.845)	0.361 (1.965)	0.015 (4.121)	0.814	1.982

unemployment - vacancy relationships for adult males, adult females and junior females and each of these shifts would have contributed to the increase in non demand-deficient unemployment observed at that time.

Comparative shares of unemployment and unfilled vacancies for age-sex sectors are presented in table 7.3.6 for the years 1964, 1969 and 1973. Between the years 1964 and 1969 there was a movement along

Table 7.3.6

Comparative Shares of U and V
(age-sex sectors)

	1964		1969		1973	
	j_i	k_i	j_i	k_i	j_i	k_i
dam	0.389	0.517	0.414	0.424	0.415	0.495
djm	0.142	0.204	0.191	0.180	0.219	0.128
daf	0.218	0.170	0.188	0.241	0.153	0.257
djf	0.251	0.108	0.207	0.155	0.213	0.121

sectoral unemployment-vacancy relationships towards balance, thus reducing the level of non demand-deficient unemployment. The exception to this trend was the adult females sector which moved towards

balance to 1966 and thereafter away from balance. In the period from 1969 to 1973 there was a movement away from balance for each sector with associated increases in non demand-deficient unemployment. The magnitude of the time trend variable coefficients for junior males, and junior females reflects movements up the respective u_i-v_i relationships away from a position of balance (an imbalance in the distribution of demand between sectors).

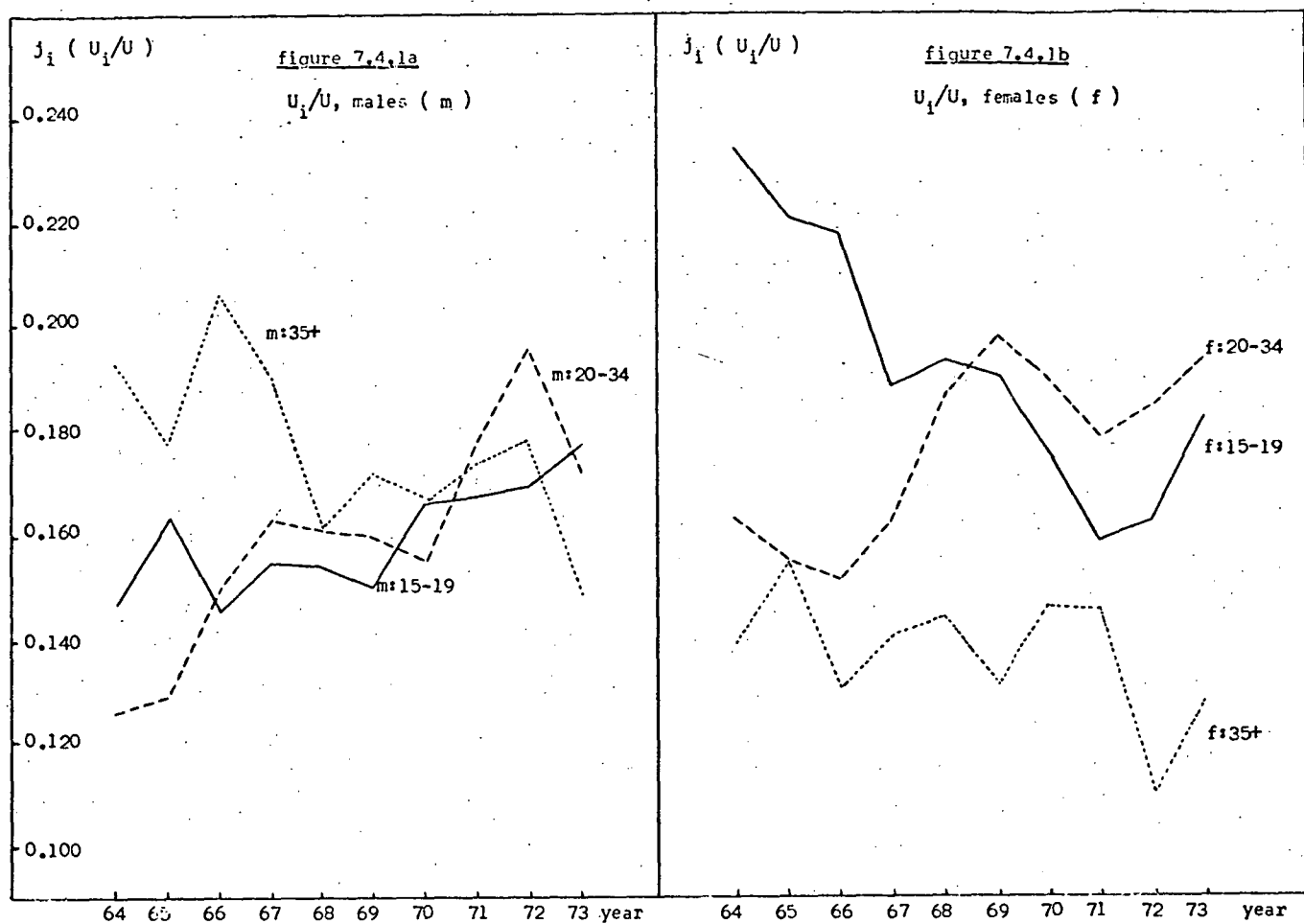
In general it can be concluded that the movements towards balance in the early part of the period more than offset the effect of increases in non demand-deficient unemployment for adult females to give an overall reduction in non demand-deficient unemployment from 1967. The subsequent movements away from balance for each sector together with outward shifts of the u_i-v_i relationships (except junior males) resulted in a large increase in non demand-deficient unemployment in the labour market in 1972.

7.4 Age-Sex Sectors : Structure of Unemployment.

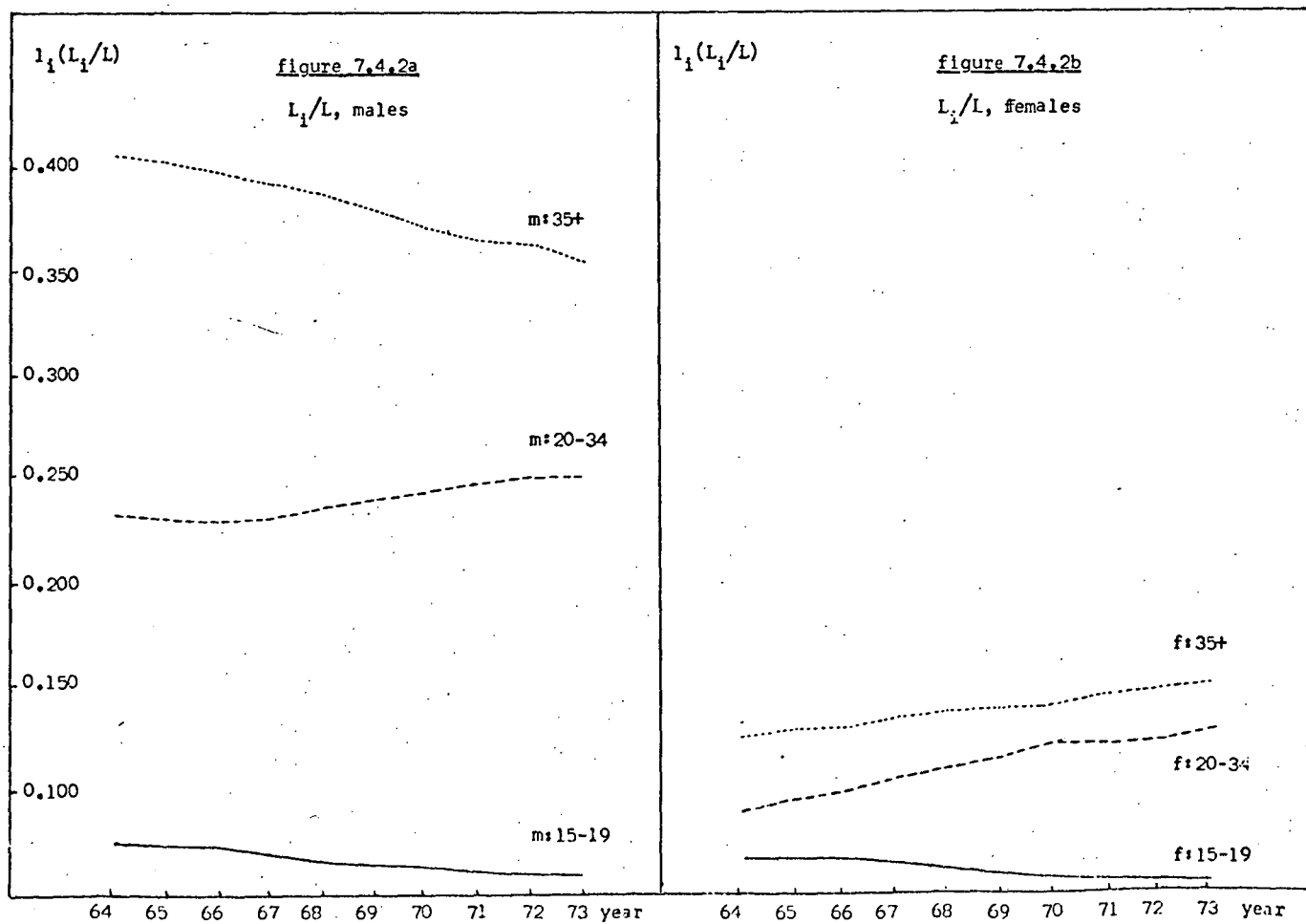
This section presents an analysis of the structure of unemployment, as outlined in section 3.9, for age-sex sectors. Figures 7.4.1 to 7.4.5 portray in graphical form the Labour Force Survey data presented in appendix 4.3, and table 7.4.1 analyses changes in the structure of unemployment between 1964 and 1969, and between 1969 and 1973.

Sectoral shares of total unemployment (U_i/U) are presented in figures 7.4.1a (males) and 7.4.1b (females). With respect to figure 7.4.1a it is apparent that males 15-19 years accounted for an increasing share of unemployment in the period 1964-73, from 14.7 per cent in 1964 to 17.7 per cent in 1973. The share of unemployment for males 20-34 years of age also increased while that for males aged 35 years and over decreased.

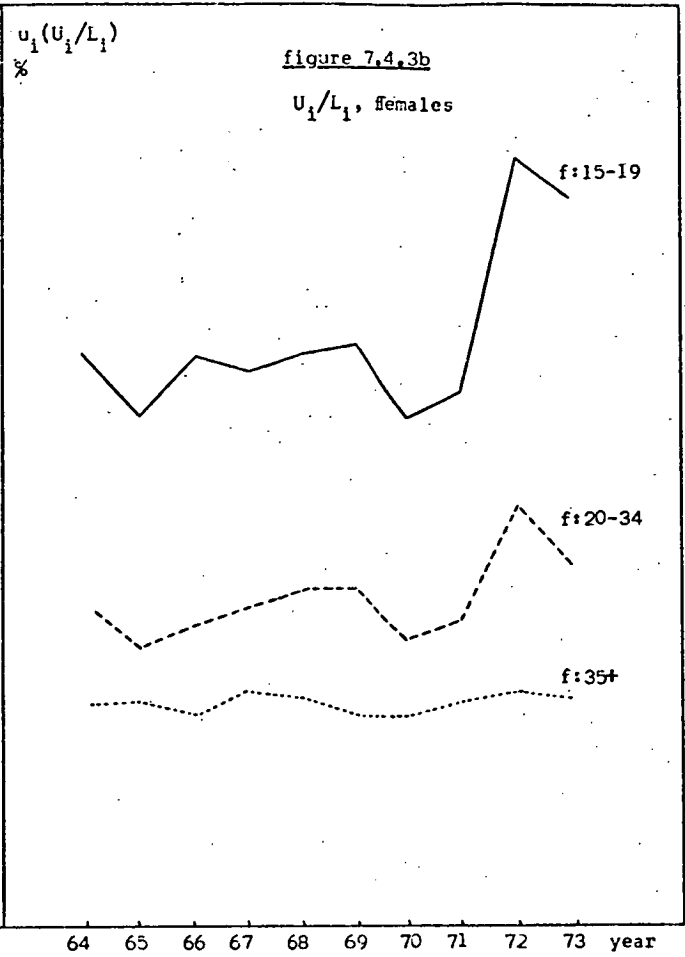
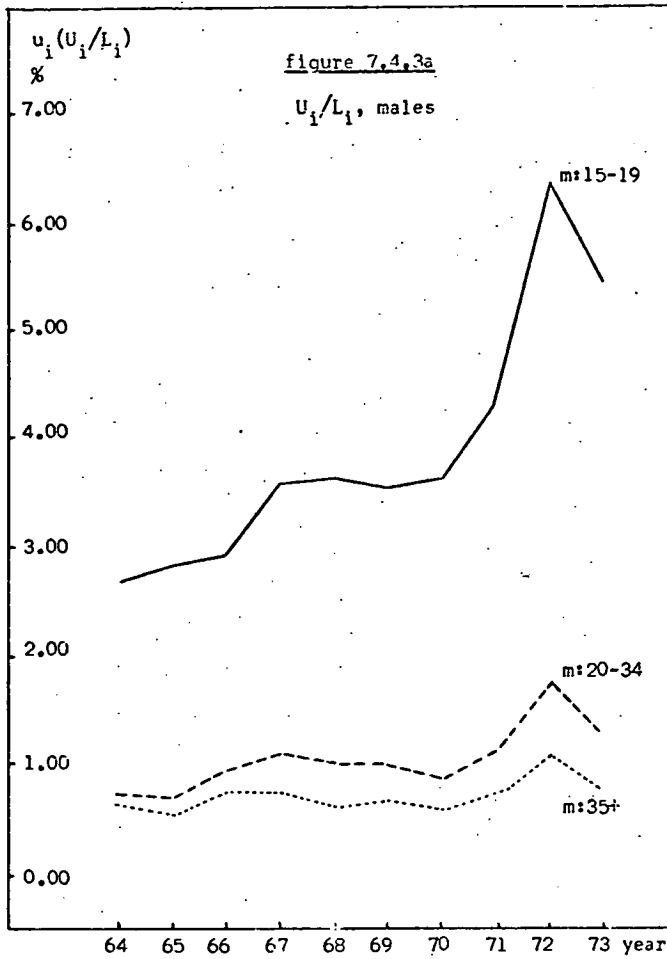
AGE - SEX SECTORS (share of unemployment)



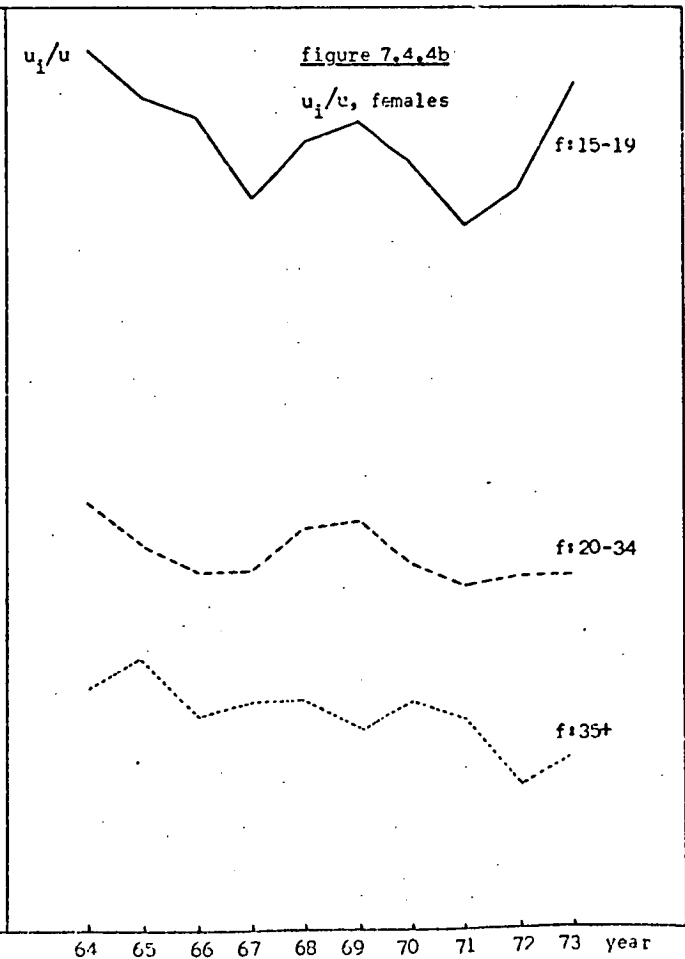
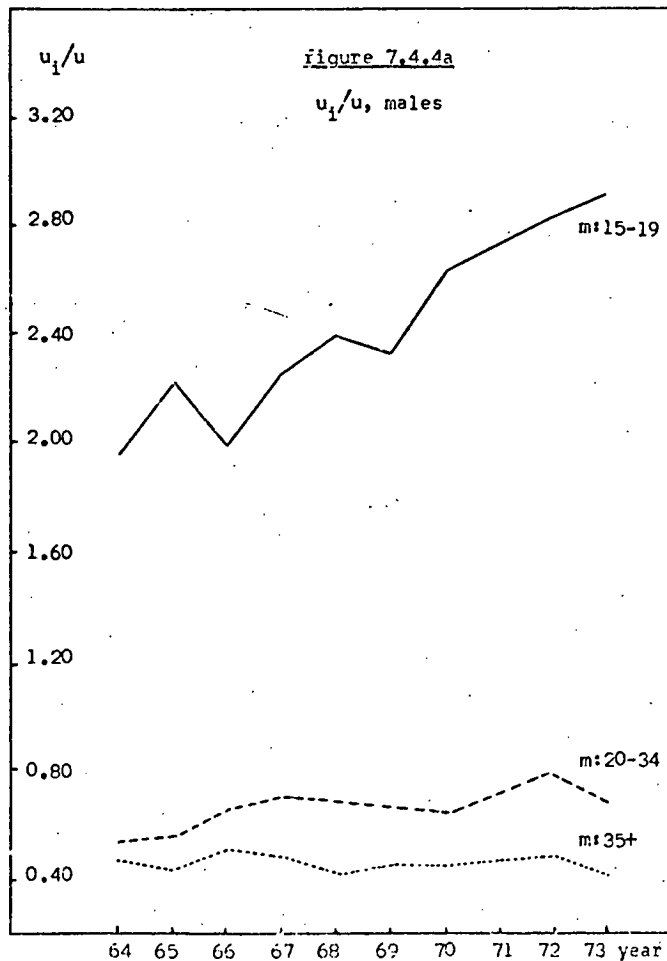
AGE - SEX SECTORS (share of the labour force)



AGE - SEX SECTORS (sectoral unemployment percentages)



AGE - SEX SECTORS (relative unemployment percentages)



In the period 1964-73, the female share of unemployment decreased from 53.6 per cent in 1964 to 50.3 per cent in 1973. The share of unemployment accounted for by females aged 20-34 years increased in the period, but this increase was more than offset by decreases for females 15-19 years and 35 years and over.

Sectoral labour force proportions, l_i , (L_i/L) for the period 1964-73 are presented in figures 7.4.2a and 7.4.2b. There was a decrease in the share of the labour force for males 15-19 years and 35 years and over, offset partly by an increase for males 20-34 years. The total males share of the labour force decreased from 71.5 per cent in 1964 to 66.6 per cent in 1973. There were increases in the shares of the labour force for females 20-34 years and 35 years and over; females 15-19 years decreased as a proportion of the labour force.

Sectoral unemployment percentages, u_i , (U_i/L_i) for age-sex sectors are presented in figures 7.4.3a and 7.4.3b. The unemployment percentage for males 15-19 years increased from 2.72 per cent in 1964 to 5.46 per cent in 1973; the u_i for males 20-34 years showed some tendency to increase over time while the unemployment percentage for males 35 years and over remained at a relatively low level in the period 1964-73, reaching a maximum of only 1.10 per cent in 1972. The unemployment percentage for females 15-19 years was fairly constant in the period 1964-71, increased to a maximum of 6.57 in 1972 and then decreased only slightly in 1973 to 6.20. The u_i for females 20-34 years of age increased over time, while that for females 35 years and over remained relatively stable throughout the period.

Relative unemployment percentages for age-sex sectors are presented in figures 7.4.4a and 7.4.4b. There was a marked increase in the relative unemployment percentage for males 15-19 years in the period 1964-73 and this confirms the movement along the U-V curve for

junior males observed previously. For females 15-19 years there was a decrease in the relative unemployment percentage to 1971, but an increase thereafter. There was a slight increase in the relative unemployment percentage for males 20-34 years and decreases for 20-34 year females and over 34 males and females.

Figure 7.4.5a presents time series on measures of the dispersion of age-sex unemployment percentages : the standard deviation (s.d.) and the coefficient of variation (c.v.). The s.d. was fairly stable in the period 1964-71, increased as unemployment increased in 1972 and then decreased only slightly as unemployment decreased to a greater extent in 1973. This is evident in figure 7.4.5b in which the s.d. is plotted against the aggregate unemployment percentage. The behaviour of s.d. reflects that of u_{lf} until 1973 at which time s.d. increased relative to unemployment indicating an increase in the dispersion of age-sex unemployment percentages.

The results for the c.v. confirm this conclusion : in figure 7.4.5a the coefficient of variation decreases from 0.834 in 1964 to 0.718 in 1971, suggesting a decrease in the relative dispersion of age-sex unemployment percentages, and then increased to a new maximum of 0.837 in 1973. In figure 7.4.5b it is apparent that c.v. increases relative to u_{lf} in 1973 after decreasing in the early part of the period. The reduction in the dispersion of unemployment to 1971 would have contributed to the fall in non demand-deficient unemployment in 1967 and the subsequent increased dispersion would have been a causal factor in the increase therein in 1972.

Table 7.4.1 presents an analysis of changes in the structure of unemployment for age-sex sectors as between the years 1964, 1969 and 1973. Each of these years is similar with respect to the level of demand-deficient unemployment and each period is one of movement of

the labour market into a period of high demand for labour. The analysis of structural changes is based on the following. We have from section 3.9 :

$$j_{it} = u_{it}/u_t \cdot l_{it} \quad (\text{where } l_{it} = L_{it}/L_t)$$

$$\sum_{i=1}^n j_{it} = \sum u_{it}/u_t \cdot l_{it} \quad (n \text{ is number of sectors})$$

$$\text{Define } \sum_{i=1}^n j_{it}^* = \sum u_{it}/u_t \cdot l_{i0} \quad (0 \text{ represents base year})$$

$$\text{Now, } \sum (j_{it} - j_{i0}) = \sum (j_{it} - j_{it}^*) + \sum (j_{it}^* - j_{i0}).$$

The first term on the right-hand side of the above expression represents the change in sectors' shares of unemployment resulting from changes in l_i as between the base year and year t ; the second term represents the change in sectors' shares of unemployment brought about by changes in relative unemployment percentages (u_i/u). Table 7.4.1 presents data on u_i/u , l_i and j_i for each age-sex sector for the years 1964, 1969 and 1973 and the breakdown of the change in j_i as between changes in l_i and changes in u_i/u .

Between both 1964 and 1969 and 1969 and 1973 the j_i for males 15-19 years increased, decreases in l_i being more than offset by increases in u_i/u . In 1973 males 15-19 years represented just over 6 per cent of the labour force, but accounted for almost 18 per cent of unemployment. The increasing u_i/u reflects a growing imbalance in the labour market with a consequent increase in non demand-deficient unemployment; the decreasing l_i means a lower weighting to a high unemployment sector and this would cause a fall in non demand-deficient unemployment, partially offsetting the increase generated by the change in u_i/u .

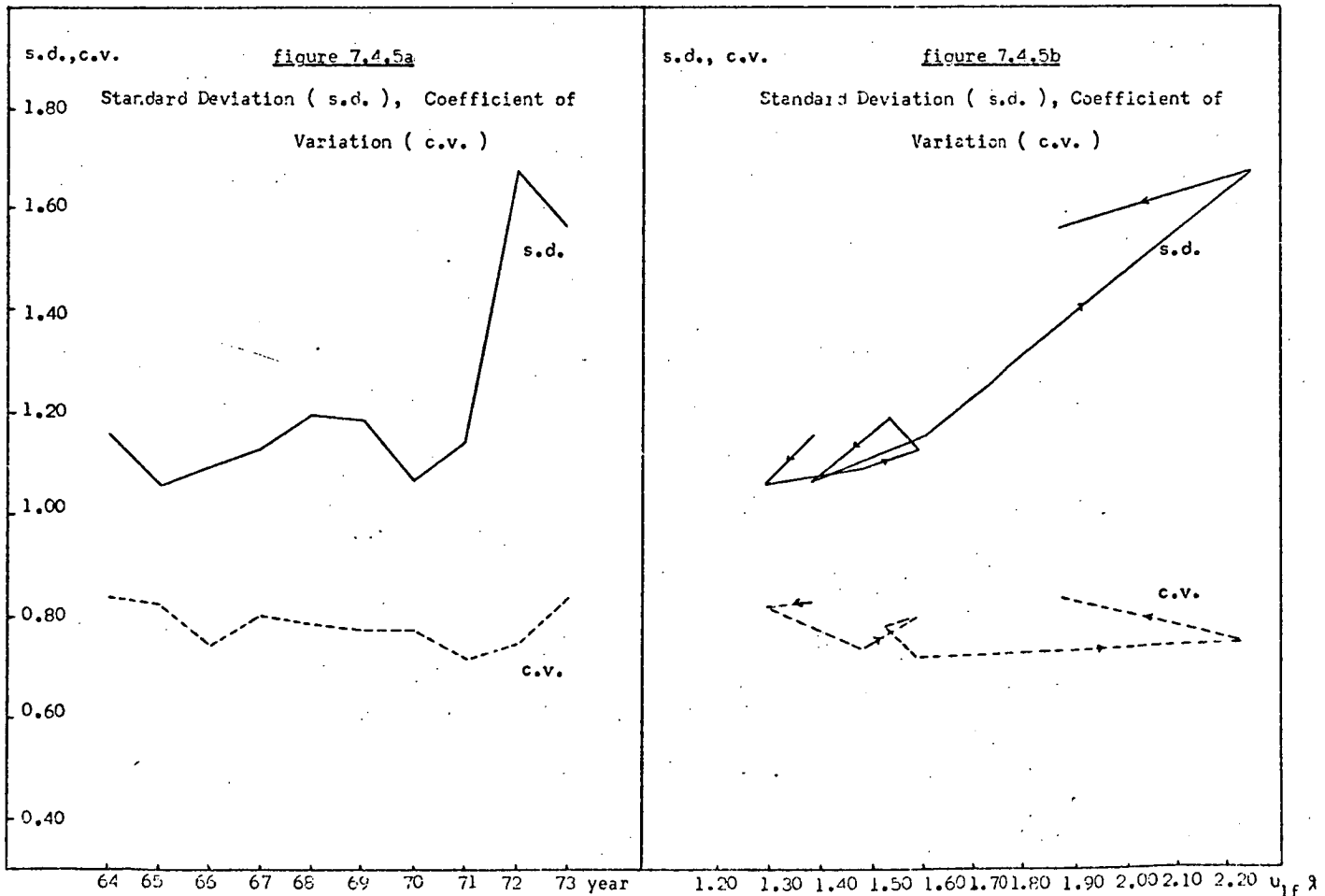
For males aged 20-34 years j_i increased from 0.126 in 1964 to 0.160 in 1969 with an increase in both l_i and u_i/u , the change in

Table 7.4.1

Changes in the Structure of Age-Sex Unemployment.

SECTOR	1964			1969			Change in j_i due to		1973			Change in j_i due to	
	u_i/u	l_i	j_i	u_i/u	l_i	j_i	l_i	u_i/u	u_i/u	l_i	j_i	l_i	u_i/u
Males :													
15 - 19 years	1.96	0.075	0.147	2.33	0.064	0.150	-0.025	0.028	2.92	0.061	0.177	-0.010	0.037
20 - 34 years	0.54	0.233	0.126	0.66	0.241	0.160	0.006	0.028	0.68	0.251	0.172	0.008	0.004
35 years and over	0.47	0.407	0.193	0.45	0.381	0.172	-0.011	-0.010	0.42	0.355	0.148	-0.012	-0.012
Total Males	0.65	0.715	0.464	0.70	0.686	0.481	-0.019	0.036	0.75	0.666	0.497	-0.017	0.033
Females :													
15 - 19 years	3.45	0.068	0.234	3.18	0.060	0.190	-0.026	-0.018	3.32	0.055	0.182	-0.017	0.009
20 - 34 years	1.78	0.091	0.163	1.71	0.116	0.193	0.042	-0.007	1.51	0.128	0.193	0.018	-0.023
35 years and over	1.10	0.126	0.139	0.95	0.138	0.131	0.011	-0.019	0.86	0.150	0.128	0.009	-0.012
Total Females	1.88	0.285	0.536	1.65	0.314	0.519	0.049	-0.066	1.51	0.334	0.503	0.029	-0.045

AGE - SEX SECTORS (standard deviation, coefficient of variation)



u_i/u being the dominant change with an impact on j_i of 0.028 compared with 0.006 for l_i . A further increase in both l_i and u_i/u occurred between 1969 and 1973, but on a lesser scale to the 1964-69 change. Since the sector is characterised by low relative unemployment, the changes in both l_i and u_i/u would have exerted a downward force on non demand-deficient unemployment.

The share of males aged 35 years and over in unemployment decreased between both 1964 and 1969 and between 1969 and 1973, with decreases in both l_i and u_i/u . These changes were the opposite of those for males 20-34 years and would have acted to increase non demand-deficient unemployment. For males in total the share of unemployment increased from 0.464 in 1964 to 0.497 in 1973, decreases in l_i being more than offset by increases in u_i/u .

Between 1964 and 1969 the j_i for females 15-19 years decreased from 0.234 to 0.190 with decreases in both l_i and u_i/u ; a further decrease in j_i from 1969 to 1973 resulted from a decrease in l_i , only partially offset by an increase in u_i/u . The lower weighting of this sector in the labour force would have acted to reduce non demand-deficient unemployment. In 1973 females aged 15-19 accounted for only 5.5 per cent of the labour force, but for 18 per cent of unemployment.

In the period 1964-73, the share of unemployment for females 20-34 years increased with decreases in u_i/u being more than offset by increases in l_i . These increases in l_i would have resulted in some increase in the level of non demand-deficient unemployment, while the decreases in u_i/u would have tended to reduce the level thereof.

There was a small decrease in the share of unemployment accounted for by 35 and over females, but there would have been no significant impact on the level of non demand-deficient unemployment.

7.5 Regions : Unemployment - Vacancy Relationships.

7.5.1 Sydney

Time series for the period 1964-73 on U_{gsy} and V_{gsy} are presented in figure 7.5.1. Inverse parallelism between the two series is evident throughout the period. In periods of high demand for labour the unfilled vacancies series is considerably in excess of the unemployment series, even without allowing for an understatement of the "true" level of unfilled vacancies. The ratio of unfilled vacancies to unemployment at the turning points in periods of high demand for labour is approximately two to one. The level of unemployment at which the two series intersected increased through time, but most of this increase is the result of growth in the labour force.

Estimated equations for the Sydney unemployment-vacancy relationship are presented as equations H.1.1 to H.1.8 in table 7.5.1. The linear equations perform markedly better than the log-linear equations; the coefficients on all dummy variables tested, for both linear and log-linear equations, are not significantly different from zero and this is reflected in the minimal improvement in fit of the linear equations consequent on the inclusion of dummy variables - the inclusion of dummy variables in the log-linear equations results in a deterioration in goodness of fit. The results show that there was no significant positional shift of the Sydney unemployment-vacancy relationship in either 1967 or 1972.

Figure 7.5.2 portrays the proportion of total unemployment (j_{gsy}) and unfilled vacancies (k_{gsy}) in the Sydney metropolitan area. The sector's share of unemployment declined in the period from 0.161 in 1964 to 0.126 in 1973, while at the same time its share of unfilled vacancies increased from 0.237 in 1964 to 0.300 in 1973. This growing gap between j_{gsy} and k_{gsy} would have caused an increase in non demand-

SYDNEY

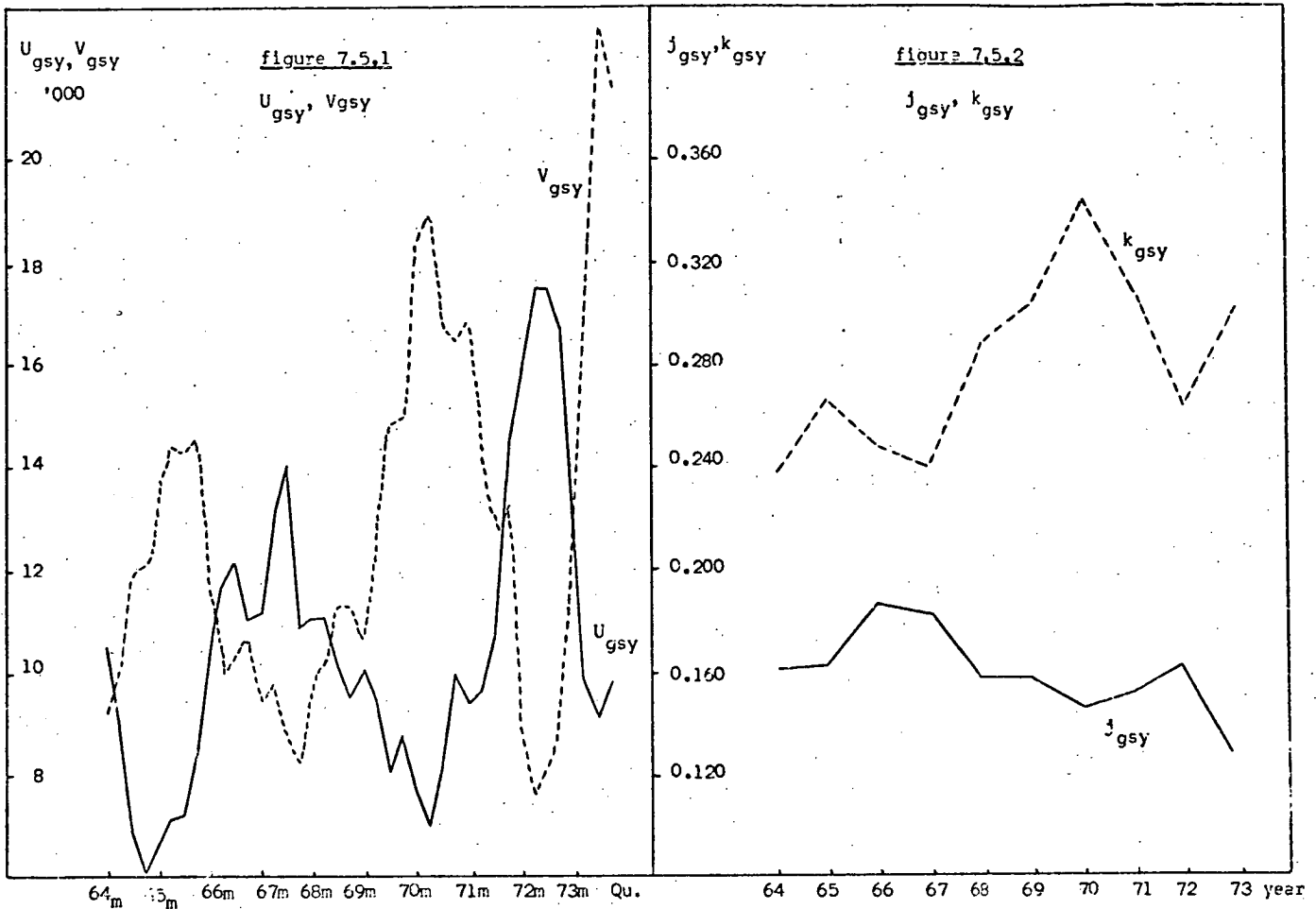


Table 7.5.1

H.1 Equations : Sydney.

Equation No.	EQUATION	\bar{R}^2	D.W.S.
H.1.1	$U_{gsy} = 14489 - 0.649V_{gsy} + 209t'$ (13.074) (7.212) _{gsy} (7.328)	0.655	1.937
H.1.2	$U_{gsy} = 14801 - 0.651V_{gsy} - 696D_1 + 1249D_2 + 206t'$ (13.229) (7.104) _{gsy} (0.532) (1.025) ₄ (2.911)	0.659	2.084
H.1.3	$U_{gsy} = 14080 - 0.602V_{gsy} - 0.098D_1V_{gsy} + 0.058D_2V_{gsy} + 235t'$ (7.866) (4.419) _{gsy} (1.013) ₂ (0.661) ₄ (3.940)	0.658	2.093
H.1.4	$U_{gsy} = 13054 - 0.506V_{gsy} + 1102D_1 - 0.168D_2V_{gsy} + 1107D_3 + 0.002D_4V_{gsy} + 217t'$ (3.901) (1.830) _{gsy} (0.296) ₂ (0.519) ₂ (0.358) ₄ (0.010) ₄ (2.823)	0.642	2.108
H.1.5	$\bar{U}_{gsy} = 15.493 - 0.712\bar{V}_{gsy} + 0.020t'$ (7.697) (3.283) _{gsy} (3.795)	0.304	2.242
H.1.6	$\bar{U}_{gsy} = 15.213 - 0.679\bar{V}_{gsy} + 0.131D_1 + 0.107D_2 + 0.013t'$ (7.179) (2.954) _{gsy} (0.521) ₂ (0.453) ₄ (0.921)	0.271	2.268
H.1.7	$\bar{U}_{gsy} = 15.379 - 0.697\bar{V}_{gsy} + 0.014D_1\bar{V}_{gsy} + 0.011D_2\bar{V}_{gsy} + 0.013t'$ (7.422) (3.109) _{gsy} (0.500) ₂ (0.442) ₄ (0.934)	0.271	2.266
H.1.8	$\bar{U}_{gsy} = 12.736 - 0.415\bar{V}_{gsy} + 3.431D_1 - 0.356D_2\bar{V}_{gsy} - 0.615D_3 + 0.073D_4\bar{V}_{gsy} + 0.015t'$ (2.179) (0.666) _{gsy} (0.494) ₂ (0.475) ₂ (0.133) ₄ (0.152) ₄ (0.999)	0.232	2.293

deficient unemployment in the labour force in the period 1964-73, although it should be noted that the gap did narrow at times in the period.

7.5.2 Non-Metropolitan New South Wales.

The time series on U_{gns} and V_{gns} , presented graphically in figure 7.5.3, did not intersect at any point in the 1964-73 period. Unemployment was stable in the period 1964-71, increased in 1972 and then decreased only marginally with the expansion in demand for labour in 1973; the unfilled vacancies series showed little variation except for the marked increase in 1973.

Estimated unemployment-vacancy relationships for non-metropolitan N.S.W. are presented as equations H.2.1 to H.2.8 in table 7.5.2. The inclusion of dummy variables improves the fit of both the linear and log-linear equations. Equation H.2.4, the linear equation which has both shift and slope dummy variables, shows a significant increase in the absolute slope of the relationship in 1967, more than offset by a subsequent decrease in 1972. In equation H.2.8, the best-fitting log-linear equation, the coefficients on the 1967 dummy variables are insignificant suggesting that the significance thereof in the linear equations was induced by a non-linear segment of the relationship experienced in 1972; the coefficients on the 1972 dummy variables are significantly different from zero and indicate a decrease in the elasticity of the relationship as from 1972. This decrease in elasticity represents an increase in non demand-deficient unemployment.

The sector's shares of unemployment, j_{gns} , and of unfilled vacancies, k_{gns} , are presented in figure 7.5.4. The gap between j_{gns} and k_{gns} narrowed to 1968 reflecting a movement towards balance with an associated decrease in non demand-deficient unemployment. After

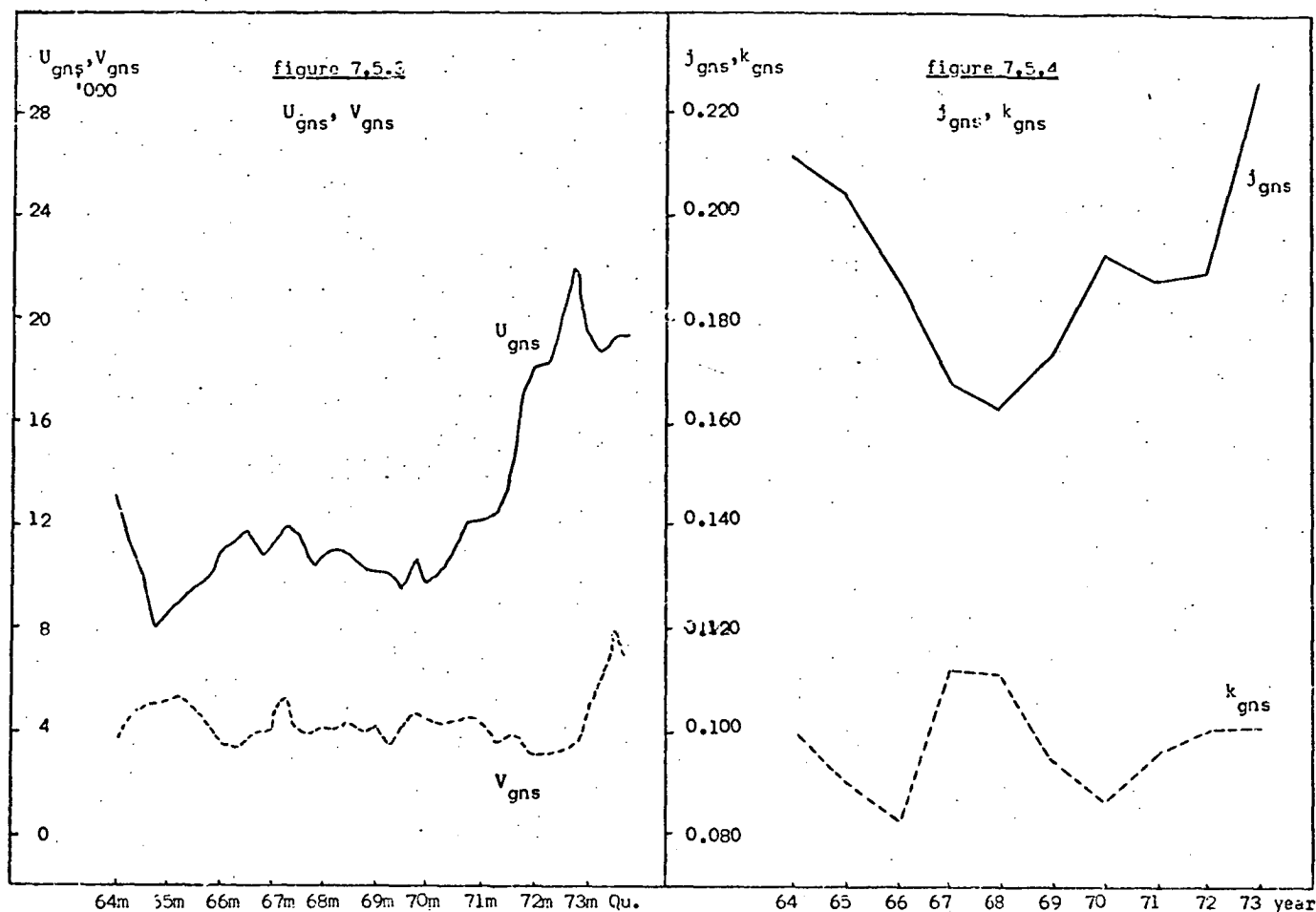


Table 7.5.2

H.2 Equations : Non-Metropolitan N.S.W.

Equation No.	EQUATION	\bar{R}^2	D.W.S.
H.2.1	$U_{gns} = 7680 + 0.080V_{gns} + 241t'$ (4.036) (0.191) _{gns} (6.889)	0.547	0.210
H.2.2	$U_{gns} = 12483 - 0.733V_{gns} - 2526D_2 + 5947D_4 + 209t'$ (9.641) (2.717) _{gns} (2.461) ² (5.995) ⁴ (3.960)	0.837	1.026
H.2.3	$U_{gns} = 14948 - 1.267V_{gns} - 0.615D_2V_{gns} + 1.446D_4V_{gns} + 193t'$ (8.369) (3.501) _{gns} (2.924) ² _{gns} (7.305) ⁴ _{gns} (4.001)	0.860	1.119
H.2.4	$U_{gns} = 13528 - 0.933V_{gns} + 5551D_2 - 1.880D_2V_{gns} - 3919D_4 + 2.425D_4V_{gns} + 180t'$ (5.290) (1.665) _{gns} (1.303) ² (1.905) ² _{gns} (1.054) ⁴ (2.736) ⁴ _{gns} (3.548)	0.859	1.258
H.2.5	$\bar{U}_{gns} = 9.696 - 0.074\bar{V}_{gns} + 0.017t'$ (8.129) (0.518) _{gns} (7.106)	0.554	0.240
H.2.6	$\bar{U}_{gns} = 11.586 - 0.290\bar{V}_{gns} - 0.188D_2 + 0.369D_4 + 0.016t'$ (13.869) (2.914) _{gns} (2.360) ² (4.830) ⁴ (3.925)	0.804	0.866
H.2.7	$\bar{U}_{gns} = 11.698 - 0.303\bar{V}_{gns} - 0.022D_2\bar{V}_{gns} + 0.045D_4\bar{V}_{gns} + 0.016t'$ (13.945) (3.038) _{gns} (2.293) ² _{gns} (1.984) ⁴ _{gns} (3.795)	0.808	0.883
H.2.8	$\bar{U}_{gns} = 12.675 - 0.418\bar{V}_{gns} + 3.029D_2 - 0.383D_2\bar{V}_{gns} - 5.275D_4 + 0.680D_4\bar{V}_{gns} + 0.013t'$ (7.927) (2.197) _{gns} (1.148) ² (1.211) ² _{gns} (2.203) ⁴ (2.358) ⁴ _{gns} (3.343)	0.825	1.079

1968 the gap increased, apart from a temporary decrease in 1971-72, and this trend would have contributed to the increase in non demand-deficient unemployment as from 1972. That is, the sector added to non demand-deficient unemployment in 1972 both by an outward movement of the sectoral unemployment-vacancy relationship and a movement along the relationship away from a position of balance.

7.5.3 Melbourne.

Time series on unemployment and unfilled vacancies for the Melbourne metropolitan area, U_{gmn} and V_{gmn} respectively, are presented in figure 7.5.5. Inverse parallelism is evident throughout 1964-73 with the unfilled vacancy series in excess of the unemployment series for a large proportion of the period. The series intersected on four occasions in the 1964-73 period with a decrease in the level of unemployment at the point of intersection between 1967_s and 1968_d, no change to 1971 and an increase to 1973_m. This suggests changes in non demand-deficient unemployment for Melbourne similar to those for the aggregate labour market.

Estimated unemployment-vacancy relationships for Melbourne are presented in table 7.5.3. The linear equations perform better than the log-linear equations, the same as for the Sydney metropolitan area. The best-fitting equation is H.3.4 with an \bar{R}^2 of 0.896; the coefficients on the 1967 dummy variables and the 1972 slope dummy are significantly different from zero and suggest an increase in absolute slope in 1967 of greater magnitude than the later decrease in 1972. In the equivalent log-linear equation H.3.8 only the coefficients on the 1972 dummy variables are significant, indicating that the apparent shift in 1967 resulted from movement along a non-linear portion of the $U_{gmn}-V_{gmn}$ curve. The shift in 1972 reflects an increase in the

MELBOURNE

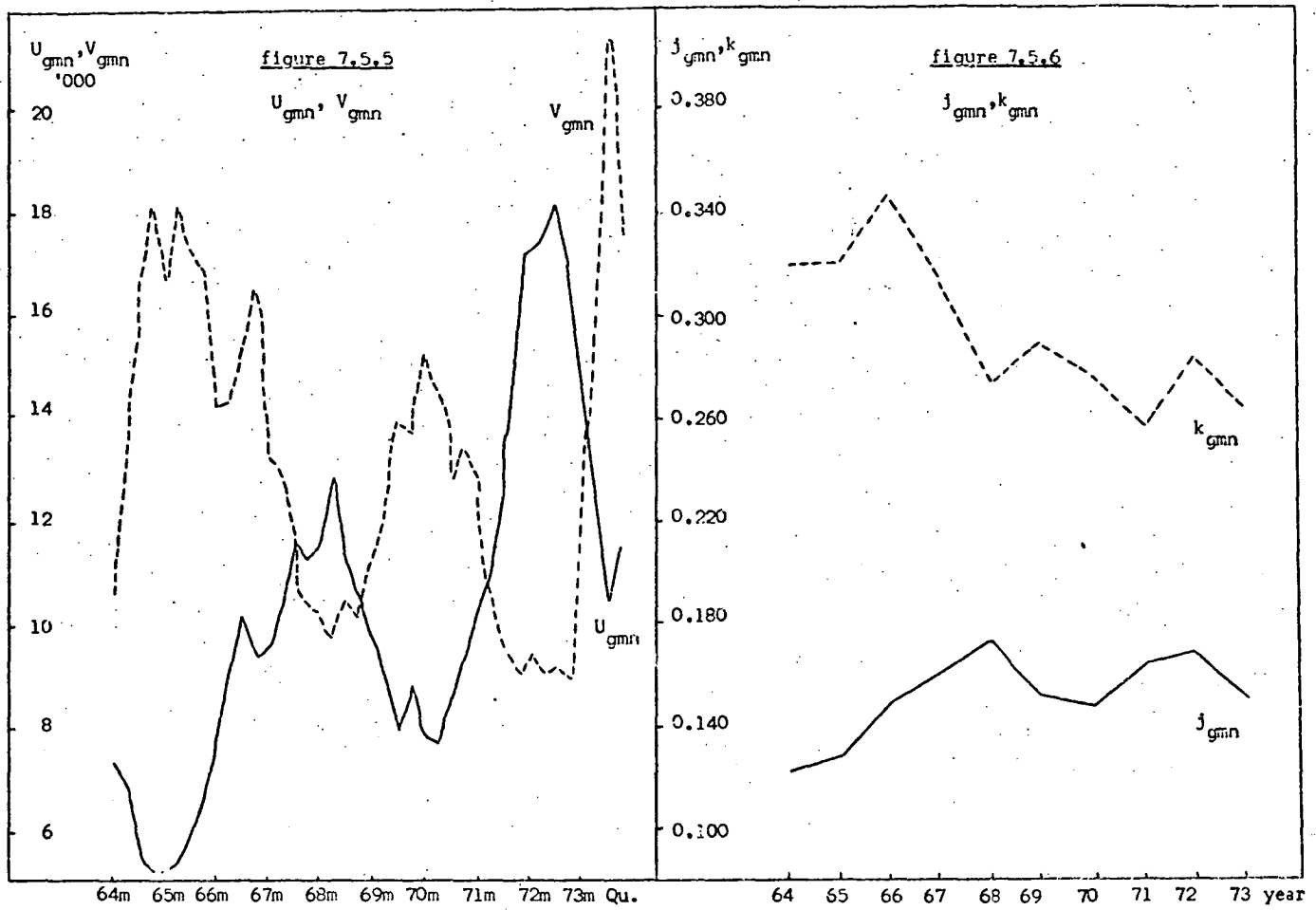


Table 7.5.3

H.3 Equations : Melbourne.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.3.1	$U_{gm\bar{n}} = 14027 - 0.541V_{gm\bar{n}} + 176t'$ (9.735) (5.922) (7.149)	0.745	0.287
H.3.2	$U_{gm\bar{n}} = 17647 - 0.741V_{gm\bar{n}} - 2533D_{gm\bar{n}}^2 + 2999D_{gm\bar{n}}^4 + 183t'$ (14.617) (9.747) (2.743) (3.765) (4.168)	0.867	1.041
H.3.3	$U_{gm\bar{n}} = 16997 - 0.701V_{gm\bar{n}} - 0.238D_{gm\bar{n}}^2 V_{gm\bar{n}} + 0.240D_{gm\bar{n}}^4 V_{gm\bar{n}} + 199t'$ (13.021) (9.169) (4.440) (4.470) (5.212)	0.888	1.145
H.3.4	$U_{gm\bar{n}} = 13640 - 0.480V_{gm\bar{n}} + 5832D_{gm\bar{n}}^2 - 0.643D_{gm\bar{n}}^2 V_{gm\bar{n}} - 2328D_{gm\bar{n}}^4 + 0.444D_{gm\bar{n}}^4 V_{gm\bar{n}} + 187t'$ (6.239) (3.427) (2.136) (3.294) (1.110) (2.716) (4.778)	0.896	1.108
H.3.5	$\bar{U}_{gm\bar{n}} = 15.804 - 0.724\bar{V}_{gm\bar{n}} + 0.017t'$ (15.373) (6.853) (7.855)	0.797	0.310
H.3.6	$\bar{U}_{gm\bar{n}} = 17.569 - 0.915\bar{V}_{gm\bar{n}} - 0.216D_{gm\bar{n}}^2 + 0.163D_{gm\bar{n}}^4 + 0.020t'$ (17.600) (8.794) (2.273) (2.000) (4.371)	0.852	0.642
H.3.7	$\bar{U}_{gm\bar{n}} = 17.486 - 0.906\bar{V}_{gm\bar{n}} - 0.022D_{gm\bar{n}}^2 \bar{V}_{gm\bar{n}} + 0.018D_{gm\bar{n}}^4 \bar{V}_{gm\bar{n}} + 0.019t'$ (18.011) (2.970) (2.269) (2.105) (4.304)	0.853	0.645
H.3.8	$\bar{U}_{gm\bar{n}} = 17.938 - 0.953\bar{V}_{gm\bar{n}} + 2.525D_{gm\bar{n}}^2 - 0.293D_{gm\bar{n}}^2 \bar{V}_{gm\bar{n}} - 4.998D_{gm\bar{n}}^4 + 0.551D_{gm\bar{n}}^4 \bar{V}_{gm\bar{n}} + 0.019t'$ (8.342) (4.264) (0.931) (1.028) (2.373) (2.452) (4.380)	0.867	0.621

level of non demand-deficient unemployment, contributing to the aggregate increase therein at that time.

Figure 7.5.6 graphically presents the share of the Melbourne sector in total unemployment (j_{gmn}) and in total unfilled vacancies (k_{gmn}). The sector's share of unemployment increased from 0.123 in 1964 to 0.152 in 1969 and then remained at about that level for the rest of the period. At the same time k_{gmn} decreased from 0.320 in 1964 to 0.289 in 1969 and to 0.263 in 1973. This represented a movement towards balance with the gap between j_{gmn} and k_{gmn} decreasing between 1964 and 1968 and then remaining at the reduced level until and including 1973. The sector would thus have contributed to the decrease in non demand-deficient unemployment in 1967 and, as a result of the outwards movement of the $U_{gmn}-V_{gmn}$ relationship, to the increase therein in 1972.

7.5.4 Non - Metropolitan Victoria.

Time series on unemployment and unfilled vacancies in non - metropolitan Victoria, U_{gvc} and V_{gvc} respectively, for the period 1964-73 are presented in figure 7.5.7. Inverse parallelism between the series is evident, although affected by secular trends for both U_{gvc} and V_{gvc} : there is a pronounced upward trend for unemployment and downward trend for unfilled vacancies. These trends have led to an increasing gap between the two series after they intersected in 1964-65.

Estimated unemployment-vacancy equations for the sector are presented in table 7.5.4. The inclusion of dummy variables improves the fit of both the linear and log-linear equations. The best-fitting equation is H.4.4 which shows an increase in absolute slope in 1967 more than offset by a subsequent decrease in 1972. The log-linear

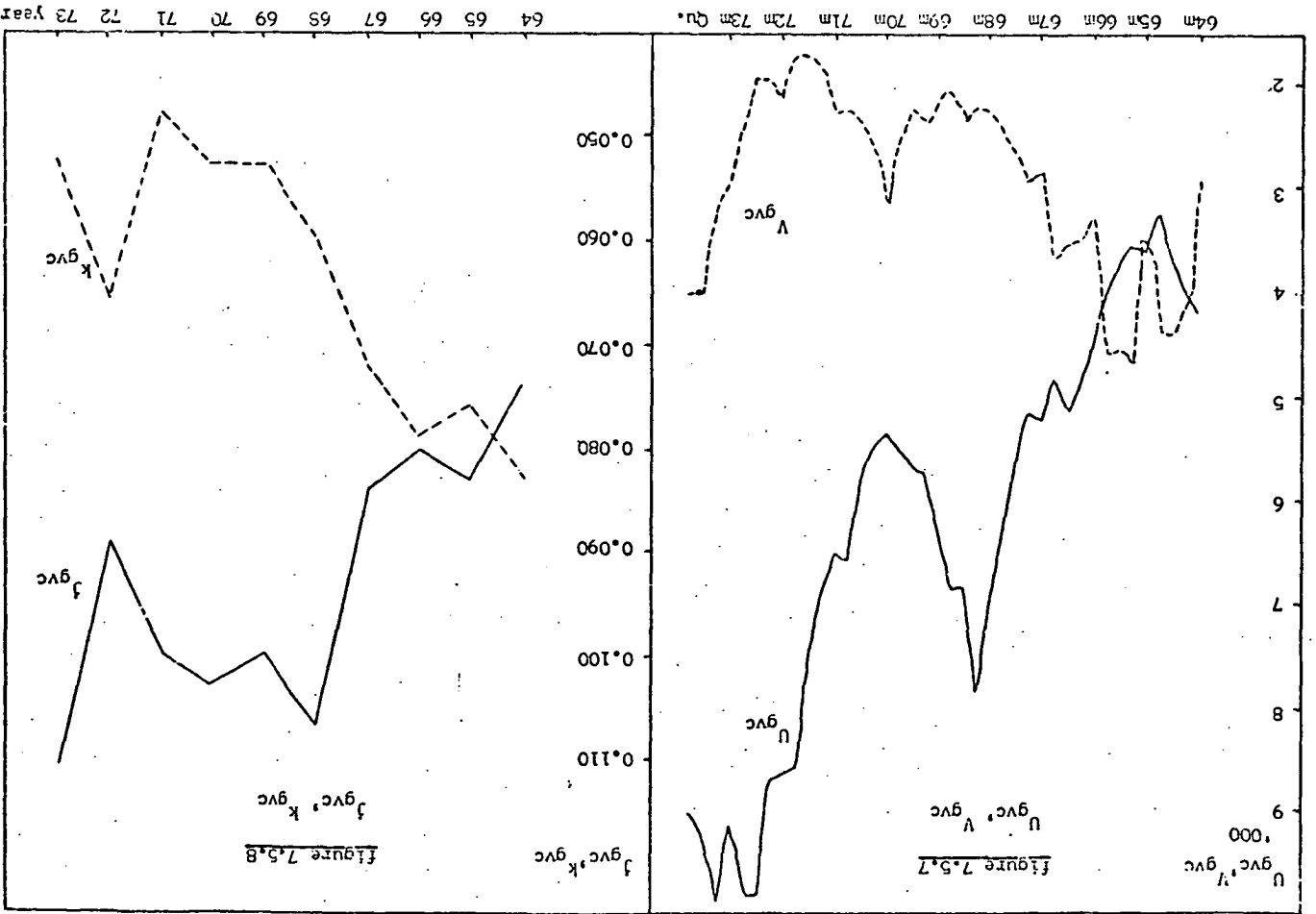


Table 7.5.4

H.4 Equations : Non-Metropolitan Victoria.

Equation No. EQUATION R² D.W.S.

H.4.1	U _{gvc} = 4002 - 0.186V _{gvc} + 144t ¹	(5.447)	(0.998)	gvc	(10.458)	0.812	0.946
H.4.2	U _{gvc} = 6295 - 0.650V _{gvc} + 281D ₁ + 2347D ₄ + 65t ¹	(8.056)	(3.397)	gvc	(0.577)	(5.211)	(2.825)
H.4.3	U _{gvc} = 7928 - 1.056V _{gvc} - 0.092D ₂ + 0.967D ₄ + 55t ¹	(9.297)	(5.287)	gvc	(0.651)	(5.909)	(2.414)
H.4.4	U _{gvc} = 6677 - 0.704V _{gvc} + 3222D ₂ - 1.125D ₄ - 1380D ₄ + 1.657D ₄ + 38t ¹	(6.285)	(2.634)	gvc	(2.239)	(2.290)	(1.083)
H.4.5	U _{gvc} = 9.907 - 0.207V _{gvc} + 0.022t ¹	(14.828)	(2.541)	gvc	(10.861)		
H.4.6	U _{gvc} = 11.249 - 0.361V _{gvc} + 0.071D ₂ + 0.294D ₄ + 0.011t ¹	(14.579)	(3.850)	gvc	(0.908)	(3.990)	(2.994)
H.4.7	U _{gvc} = 11.478 - 0.389V _{gvc} + 0.009D ₂ + 0.039D ₄ + 0.010t ¹	(15.208)	(4.275)	gvc	(0.979)	(4.200)	(2.708)
H.4.8	U _{gvc} = 13.522 - 0.634V _{gvc} - 0.102D ₂ + 0.016D ₄ - 4.029D ₄ + 0.560D ₄ + 0.006t ¹	(10.188)	(3.947)	gvc	(0.058)	(0.072)	(2.391)

equation H.4.8 indicates that the only positional change in the relationship occurred in 1972 : there was a decrease in elasticity with an associated increase in non demand-deficient unemployment. The apparent change for the linear equation in 1967 would appear to be the result of non-linearity in 1972, and not a positional shift.

Figure 7.5.8 graphically portrays the proportion of unemployment and unfilled vacancies, j_{gvc} and k_{gvc} respectively, in non-metropolitan Victoria. The trends evident in figure 7.5.7 are clearly reflected in figure 7.5.8 : the sector's share of unemployment has increased from 0.074 in 1964 to 0.111 in 1973, while the share of unfilled vacancies fell from 0.083 in 1964 to 0.054 in 1973. This indicates a growing imbalance in the labour market, movements along the sectoral U-V relationship away from a position of balance, with consequential effects on the aggregate level of non demand-deficient unemployment.

7.5.5 Brisbane.

Time series on unemployment and unfilled vacancies for the Brisbane metropolitan area, U_{gbr} and V_{gbr} respectively, are presented in figure 7.5.9. There are certain distinct features of figure 7.5.9 : firstly, the peak unemployment for the period was in 1967 and not, as would be expected, in 1972; secondly, the level of unfilled vacancies did not fall appreciably in 1972 and then rose strongly in 1973; thirdly, the lowest unemployment for the period occurred in 1973_d. The level of unemployment at which the series intersected decreased between 1964 and 1970 and then increased to the 1964 level in 1973. This suggests little change in the level of non demand-deficient unemployment for the Brisbane labour market in the period 1964-73.

Estimated unemployment-vacancy equations for Brisbane are

BRISBANE

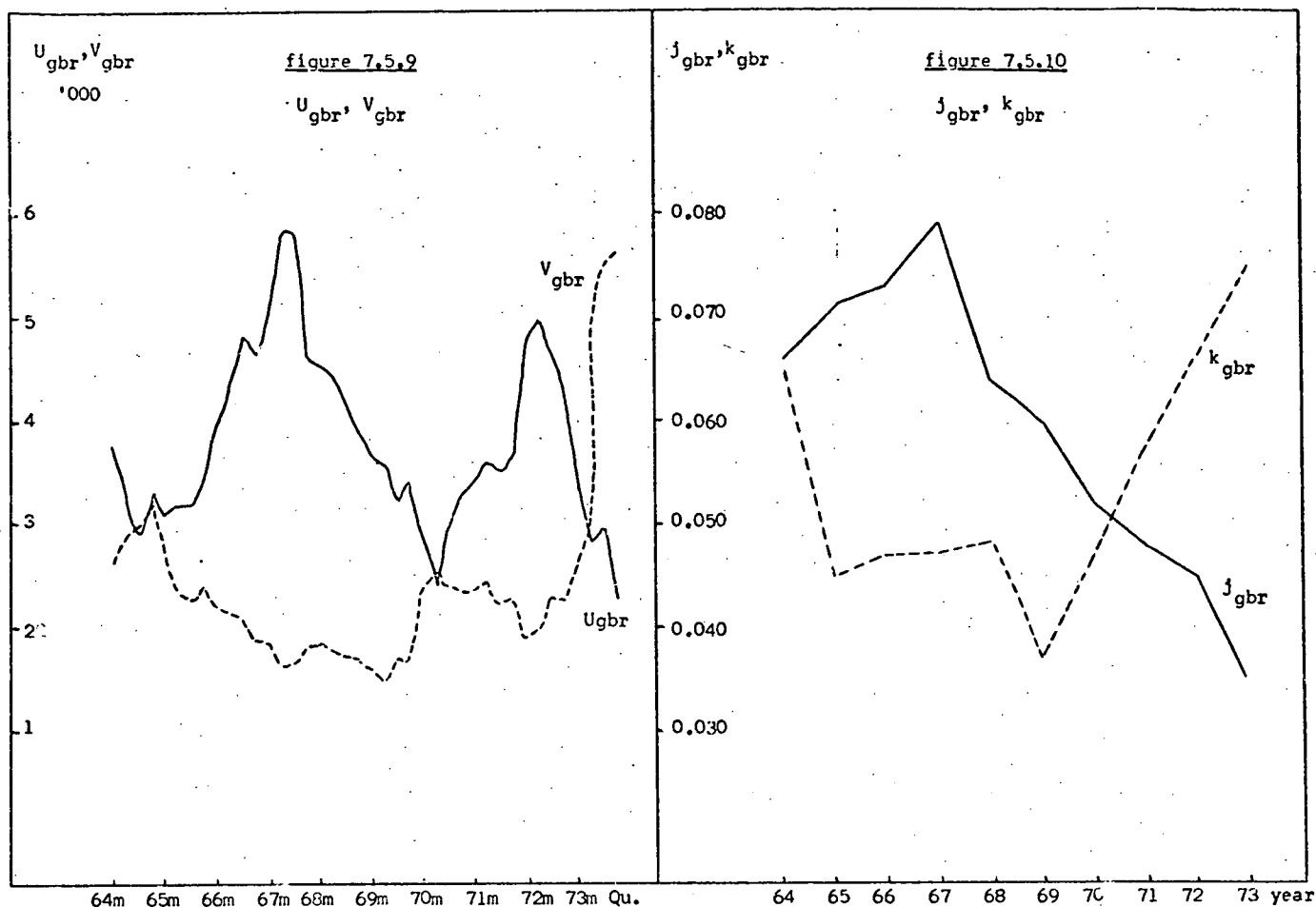


Table 7.5.5

H.5 Equations : Brisbane.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.5.1	$U_{gbr} = 5036 - 0.541V_{gbr} + 4t'$ (15.225) (4.183) (0.409)	0.299	0.352
H.5.2	$U_{gbr} = 5834 - 0.818V_{gbr} - 305D_2 + 1123D_4 + 5t'$ (14.701) (5.588) (1.120) (2.467) (0.202)	0.424	0.532
H.5.3	$U_{gbr} = 6720 - 1.159V_{gbr} - 0.136D_2V_{gbr} + 0.603D_4V_{gbr} - 14t'$ (10.041) (4.800) (0.678) (3.914) (0.602)	0.493	0.576
H.5.4	$U_{gbr} = 8191 - 1.740V_{gbr} - 1842D_2 + 0.700D_4V_{gbr} + 119D_4 + 0.463D_4V_{gbr} - 21t'$ (7.024) (4.033) (1.320) (0.888) (0.087) (0.890) (0.661)	0.510	0.723
H.5.5	$\bar{U}_{gbr} = 11.850 - 0.470\bar{V}_{gbr} + 0.000t'$ (16.955) (5.123) (0.146)	0.399	0.391
H.5.6	$\bar{U}_{gbr} = 13.723 - 0.707\bar{V}_{gbr} - 0.178D_2 + 0.292D_4 + 0.002t'$ (16.017) (6.425) (2.045) (2.125) (0.948)	0.560	0.693
H.5.7	$\bar{U}_{gbr} = 13.749 - 0.710\bar{V}_{gbr} - 0.023D_2\bar{V}_{gbr} + 0.138D_4\bar{V}_{gbr} + 0.002t'$ (17.845) (7.139) (1.672) (2.546) (0.304)	0.561	0.688
H.5.8	$\bar{U}_{gbr} = 16.416 - 1.048\bar{V}_{gbr} - 4.005D_2 + 0.512D_2\bar{V}_{gbr} + 0.769D_4 - 0.059D_4\bar{V}_{gbr} - 0.005t'$ (9.326) (4.187) (1.285) (1.225) (0.363) (0.218) (0.711)	0.563	0.840

presented as equations H.5.1 to H.5.8 in table 7.5.5. The equations generally do not perform satisfactorily with \bar{R}^2 reaching a maximum of 0.563 and the D.W.S. indicating the presence of first-order serial correlation. Although the addition of dummy variables improves the fit of the equations, the coefficients on all dummy variables in the best-fitting linear and log-linear equations are not significantly different from zero; the coefficient on t' is also insignificant. It is reasonable to conclude that there was no significant change in the Brisbane unemployment-vacancy relationship in the period 1964-73 and, thus, no change in non demand-deficient unemployment for the sector.

The sector's share of unemployment, j_{gbr} , and of unfilled vacancies, k_{gbr} , is presented in figure 7.5.10. The share of unemployment increased to 1967 and then decreased, from 0.066 in 1964 to 0.079 in 1967 and to a low for the total period of 0.034 in 1973. The share of unfilled vacancies decreased from 0.066 in 1964 to 0.037 in 1969 and then increased to 0.075 in 1973. The gap between j_{gbr} and k_{gbr} increased to 1967, decreased to 1970 and then increased again with k_{gbr} in excess of j_{gbr} . The decrease in the gap to 1970 may have led to some reduction in aggregate non demand-deficient unemployment, while the increasing gap thereafter would have acted to increase aggregate non demand-deficient unemployment.

7.5.6 Non - Metropolitan Queensland

Figure 7.5.11 presents time series on unemployment and unfilled vacancies for non - metropolitan Queensland, U_{gqu} and V_{gqu} respectively. Only very weak inverse parallelism between the two series is evident and the unemployment series is subject to irregular movement. Unemployment is in excess of unfilled vacancies for the whole of the period.

NON - METROPOLITAN QUEENSLAND

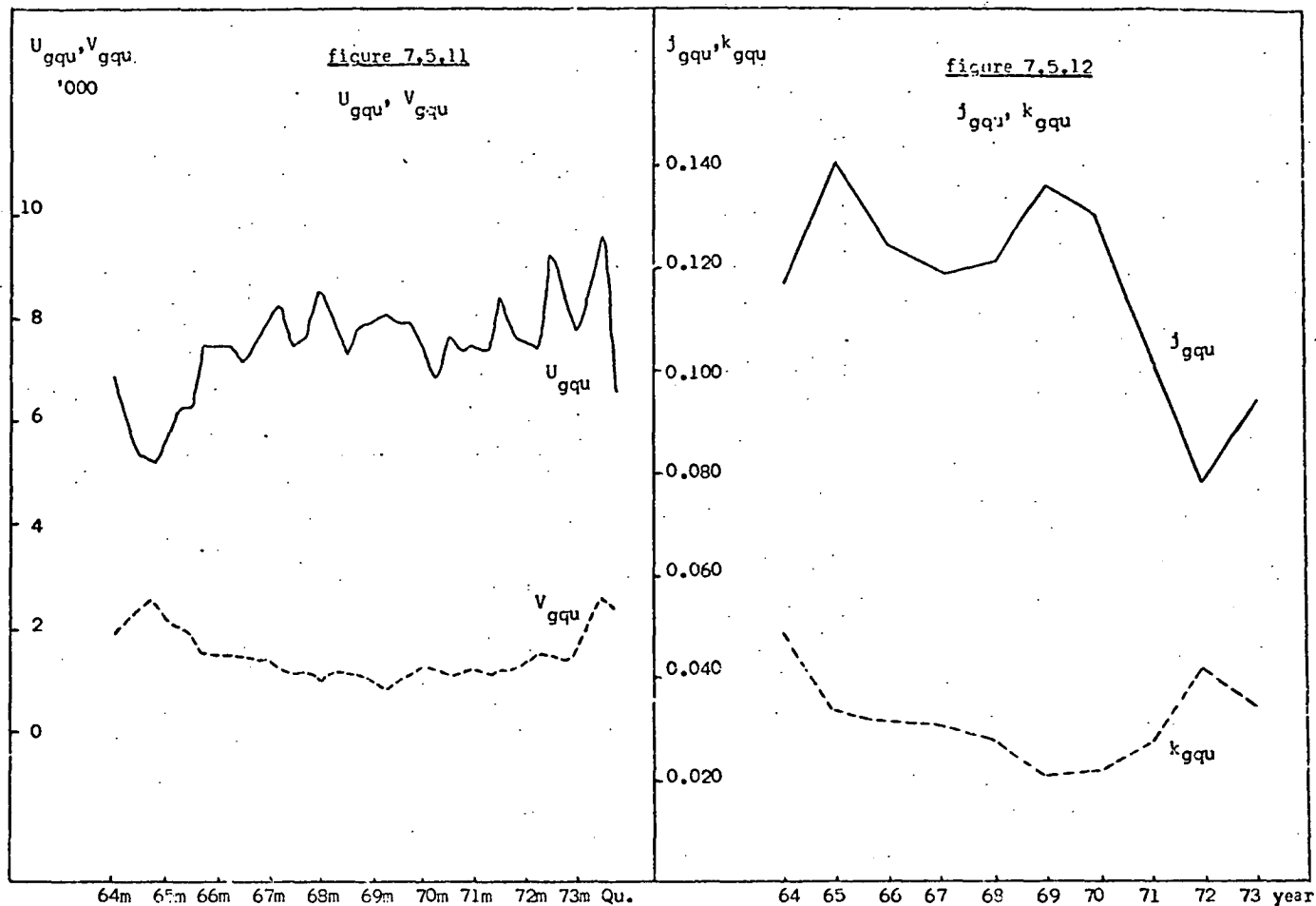


Table 7.5.6

H.6 Equations : Non-Metropolitan Queensland.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.6.1	$U_{gqu} = 7642 - 0.695V_{gqu} + 44t'$ (17.867) (2.993) (4.513)	0.464	1.484
H.6.2	$U_{gqu} = 8882 - 1.296V_{gqu} - 387D_2 + 1166D_4 + 27t'$ (14.480) (4.111) (0.834) (2.337) (1.173)	0.530	1.961
H.6.3	$U_{gqu} = 9961 - 1.800V_{gqu} - 0.000D_2V_{gqu} + 1.182D_4V_{gqu} - 13t'$ (15.006) (5.484) (0.001) (4.084) (0.581)	0.623	2.288
H.6.4	$U_{gqu} = 10819 - 2.286V_{gqu} - 1356D_2 + 0.803D_4V_{gqu} - 1250D_4 + 1.636D_4V_{gqu} - 7t'$ (13.609) (5.755) (0.934) (0.576) (0.761) (1.271) (0.271)	0.664	2.246
H.6.5	$\bar{U}_{gqu} = 10.058 - 0.175\bar{V}_{gqu} + 0.006t'$ (27.856) (3.555) (4.558)	0.504	1.288
H.6.6	$\bar{U}_{gqu} = 11.375 - 0.349\bar{V}_{gqu} - 0.103D_2 + 0.177D_4 + 0.005t'$ (22.029) (5.046) (1.631) (2.674) (1.598)	0.599	1.838
H.6.7	$\bar{U}_{gqu} = 11.403 - 0.352\bar{V}_{gqu} - 0.013D_2\bar{V}_{gqu} + 0.026D_4\bar{V}_{gqu} + 0.004t'$ (22.186) (5.124) (1.473) (2.903) (1.326)	0.604	1.867
H.6.8	$\bar{U}_{gqu} = 13.398 - 0.615\bar{V}_{gqu} - 3.172D_2 + 0.438D_4\bar{V}_{gqu} - 1.182D_4 + 0.181D_4\bar{V}_{gqu} - 0.002t'$ (19.801) (6.867) (2.286) (2.194) (0.894) (0.983) (0.524)	0.724	2.216

Estimated unemployment-vacancy relationships for the sector are presented as equations H.6.1 to H.6.8 in table 7.5.6. The inclusion of dummy variables improves the fit of both the linear and the log-linear equations, with the log-linear equations performing better than the linear equations. The best-fitting equation is H.6.8 with an \bar{R}^2 of 0.724; the coefficients on the 1967 dummy variables are significantly different from zero and the signs thereof suggest a decrease in elasticity and an increase in non demand-deficient unemployment from 1967; the coefficients on the 1972 dummy variables and t' are insignificant. The sector acted against the aggregate shift in 1967 and did not contribute to the increase in aggregate non demand-deficient unemployment in 1972.

Figure 7.5.12 presents a graph of the shares of the Queensland non-metropolitan sector in total unemployment, j_{gqu} , and unfilled vacancies, k_{gqu} . The share of unemployment increased from 0.117 in 1964 to 0.136 in 1969 and then decreased markedly to 0.094 in 1973. At the same time k_{gqu} decreased from 0.049 in 1964 to 0.021 in 1969 and then increased to 0.034 in 1973. In the period 1964-73 there was an overall narrowing of the gap between j_{gqu} and k_{gqu} , a movement toward balance which would tend to reduce aggregate non demand-deficient unemployment.

7.5.7 Western Australia.

Time series on unemployment and unfilled vacancies for Western Australia, U_{gwa} and V_{gwa} respectively, are presented in figure 7.5.13. Inverse parallelism between the two series is apparent and consistent throughout the period 1964-73. The series intersected six times in the period 1965-70 with an increase in the level of unemployment at which the intersections took place over time, part of which increase

WESTERN AUSTRALIA

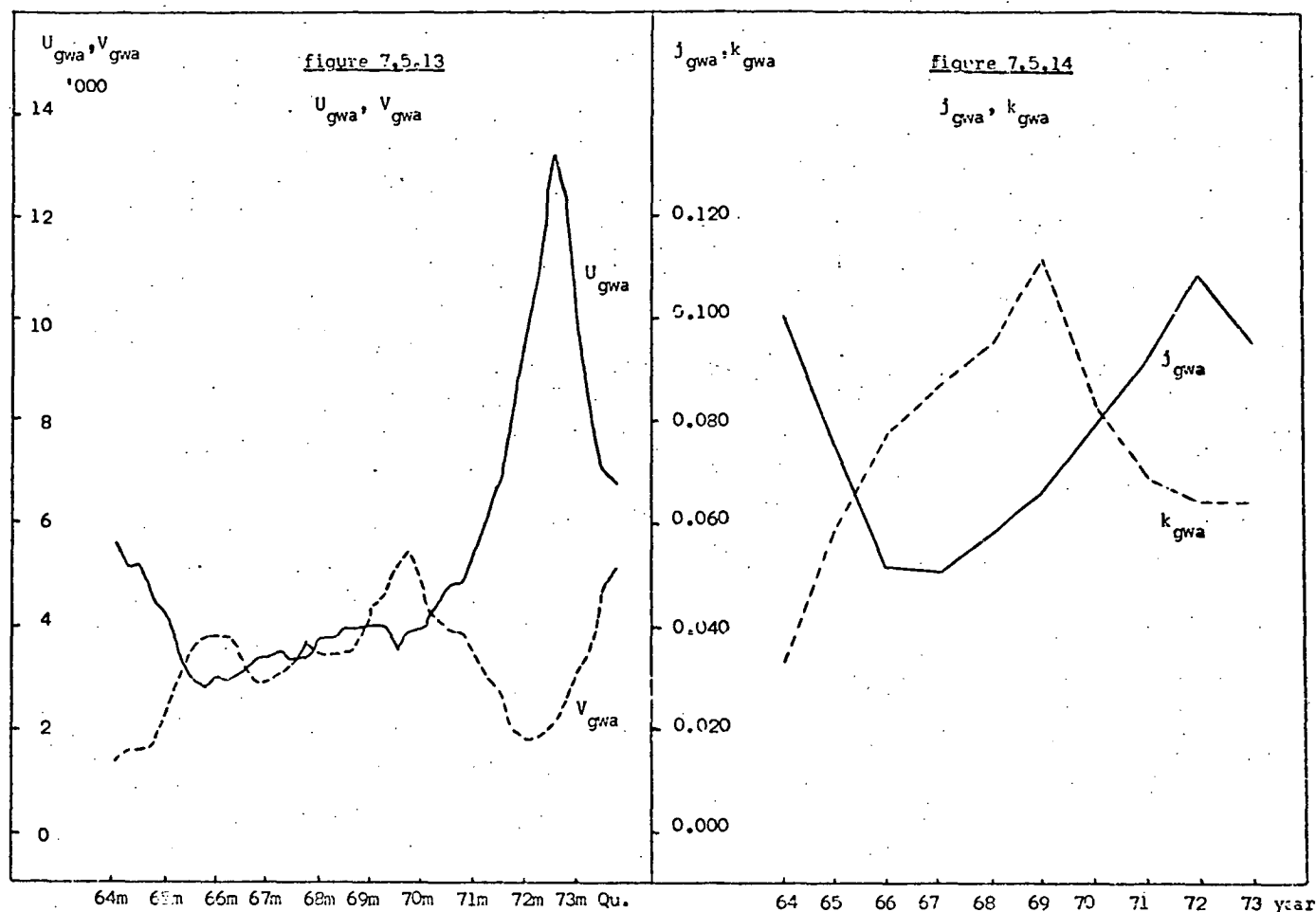


Table 7.5.7

H.7 Equations : Western Australia.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.7.1	$U_{gwa} = 6846 - 1.626V_{gwa} + 199t'$ (12.739) (10.398) (13.886)	0.858	0.496
H.7.2	$U_{gwa} = 7019 - 1.464V_{gwa} + 379D_2 + 2510D_4 + 127t'$ (16.559) (11.763) (0.732) (5.161) (4.812)	0.919	0.811
H.7.3	$U_{gwa} = 7200 - 1.617V_{gwa} - 0.000D_2V_{gwa} + 0.434D_4V_{gwa} + 166t'$ (10.865) (7.896) (0.001) (2.961) (6.981)	0.883	0.602
H.7.4	$U_{gwa} = 7047 - 1.551V_{gwa} - 1784D_2 + 0.460D_4V_{gwa} + 5445D_4 - 0.972D_4V_{gwa} + 160t'$ (11.632) (6.829) (1.397) (1.506) (5.546) (3.338) (5.796)	0.936	1.240
H.7.5	$\bar{U}_{gwa} = 14.332 - 0.807\bar{V}_{gwa} + 0.033t'$ (37.095) (16.494) (21.893)	0.938	0.563
H.7.6	$\bar{U}_{gwa} = 13.975 - 0.753\bar{V}_{gwa} + 0.053D_2 + 0.270D_4 + 0.025t'$ (45.909) (19.395) (0.973) (5.263) (8.942)	0.965	0.934
H.7.7	$\bar{j}_{gwa} = 14.075 - 0.765\bar{V}_{gwa} + 0.008D_2\bar{V}_{gwa} + 0.034D_4\bar{V}_{gwa} + 0.025t'$ (45.527) (19.471) (1.174) (5.337) (9.110)	0.965	0.941
H.7.8	$\bar{U}_{gwa} = 14.918 - 0.877\bar{V}_{gwa} - 2.204D_2 + 0.271D_4\bar{V}_{gwa} + 1.706D_4 - 0.184D_4\bar{V}_{gwa} + 0.030t'$ (31.502) (14.308) (2.689) (2.756) (1.996) (1.711) (9.442)	0.970	1.198

would be accounted for by growth of the labour force.

Estimated unemployment-vacancy relationships for Western Australia are presented as equations H.7.1 to H.7.8 in table 7.5.7. The addition of dummy variables improves the fit of the equations, although the increase in \bar{R}^2 for the log-linear equations is only marginal. The best - fitting linear equation, H.7.4, suggests an increase in the absolute slope of the relationship in 1972, contrary to the shift in the aggregate relationship. The best-fitting log-linear equation, H.7.8, indicates a significant change in the sector's unemployment-vacancy relationship in both 1967 and 1972 (the coefficient on the 1972 slope dummy variable is marginally insignificant). In 1967 there was a decrease in elasticity and, thus, an increase in non demand-deficient unemployment; in 1972 elasticity increased marginally, partly offsetting the 1967 change. In general the shifts were in the opposite direction to those for the aggregate relationship.

Figure 7.5.14 presents the sector's share of total unemployment and unfilled vacancies, j_{gwa} and k_{gwa} respectively. The share of unemployment decreased from 0.101 in 1964 to 0.066 in 1969 and then increased to 0.095 in 1973. At the same time the share of unfilled vacancies increased from 0.033 in 1964 to 0.111 in 1969 and then decreased to 0.064 in 1973. The impact of these trends on non demand-deficient unemployment was variable in the period 1964-73 because of the movements both towards and away from balance,

7.5.8 South Australia

Figure 7.5.15 presents graphs of South Australian unemployment (U_{gsa}) and unfilled vacancies (V_{gsa}) for the period 1964-73. Inverse parallelism is evident between the two series; the series intersected in 1964-65, but not in any later period.

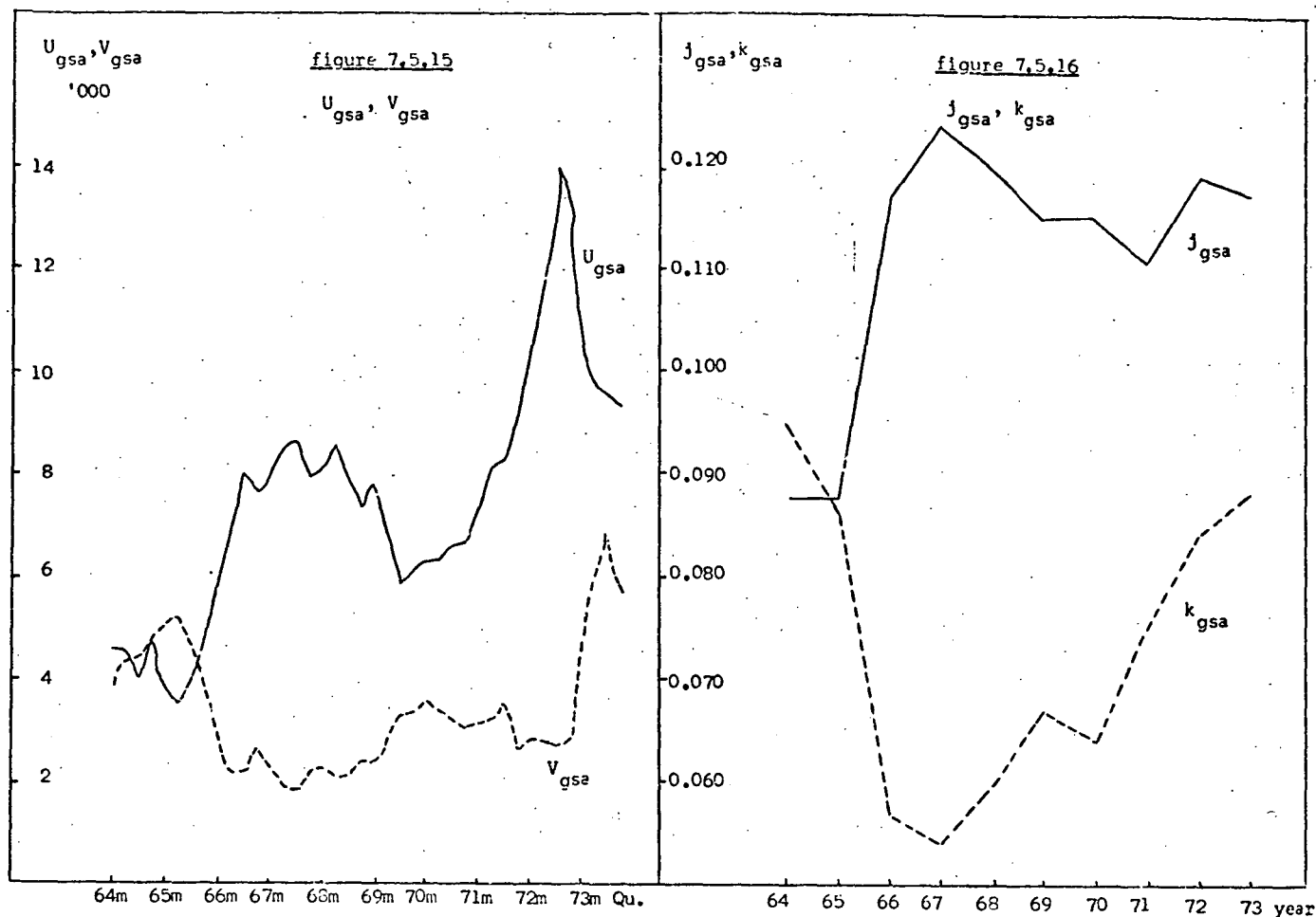


Table 7.5.8

H.8 Equations : South Australia.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.8.1	$U_{gsa} = 6604 - 0.601V_{gsa} + 167t'$ (9.167) (3.778) (8.794)	0.684	0.307
H.8.2	$U_{gsa} = 9222 - 1.199V_{gsa} - 653D_2 + 4113D_4 + 105t'$ (18.627) (10.214) (1.230) (7.894) (3.908)	0.901	1.634
H.8.3	$U_{gsa} = 8924 - 1.218V_{gsa} - 0.739D_2V_{gsa} + 0.975D_4V_{gsa} + 180t'$ (13.253) (7.996) (4.226) (8.286) (6.235)	0.906	1.490
H.8.4	$U_{gsa} = 7686 - 0.907V_{gsa} + 2600D_2 - 1.528D_2V_{gsa} - 458D_4 + 1.265D_4V_{gsa} + 181t'$ (9.331) (4.924) (2.291) (3.149) (0.303) (3.160) (5.116)	0.921	1.988
H.8.5	$\bar{U}_{gsa} = 12.107 - 0.458\bar{V}_{gsa} + 0.024t'$ (21.726) (6.607) (11.723)	0.811	0.363
H.8.6	$\bar{U}_{gsa} = 13.498 - 0.620\bar{V}_{gsa} - 0.096D_2 + 0.385D_4 + 0.019t'$ (34.633) (12.922) (1.546) (6.423) (5.984)	0.928	1.522
H.8.7	$\bar{J}_{gsa} = 13.575 - 0.629\bar{V}_{gsa} - 0.012D_2\bar{V}_{gsa} + 0.048D_4\bar{V}_{gsa} + 0.019t'$ (35.486) (13.404) (1.499) (6.686) (5.739)	0.931	1.580
H.8.8	$\bar{J}_{gsa} = 13.304 - 0.599\bar{V}_{gsa} + 2.009D_2 - 0.274D_2\bar{V}_{gsa} - 2.815D_4 + 0.390D_4\bar{V}_{gsa} + 0.023t'$ (21.149) (7.953) (1.494) (1.563) (2.356) (2.685) (5.126)	0.937	1.706

Table 7.5.8 presents estimated unemployment-vacancy equations for South Australia. The addition of dummy variables markedly improves the fit of both the linear and log-linear equations. The best-fitting linear equation suggests an increase in the absolute slope of the relationship in 1967 and a lesser decrease therein in 1972. The equivalent log-linear equation, H.8.8, shows a significant change in 1972, but the 1967 changes are marginally insignificant. The change in 1967 was towards greater elasticity while that for 1972 reflects a decrease in elasticity with an associated increase in non demand-deficient unemployment. Both these changes were in accord with the aggregate movement.

Figure 7.5.16 presents the shares of total unemployment (j_{gsa}) and unfilled vacancies (k_{gsa}) for South Australia. The share of unemployment increased from 0.088 in 1964 to 0.115 in 1969 and remained at about that level thereafter, while the share of unfilled vacancies decreased from 0.095 in 1964 to 0.067 in 1969 and then increased to 0.088 in 1973. The gap between j_{gsa} and k_{gsa} initially increased to 1967 and then gradually declined, thus tending to reduce non demand-deficient unemployment.

7.5.9 Tasmania

Time series on unemployment and unfilled vacancies for Tasmania, U_{gts} and V_{gts} respectively, are presented in figure 7.5.17. Inverse parallelism between the two series is evident, with the exception of the period 1966-68. The series did not intersect in the period 1964-73, although the gap between the two series was small in 1967-68.

Table 7.5.9 presents estimated unemployment-vacancy equations for Tasmania. The inclusion of dummy variables improves the fit of the linear equations, but in the best-fitting equation, H.9.2, only

TASMANIA

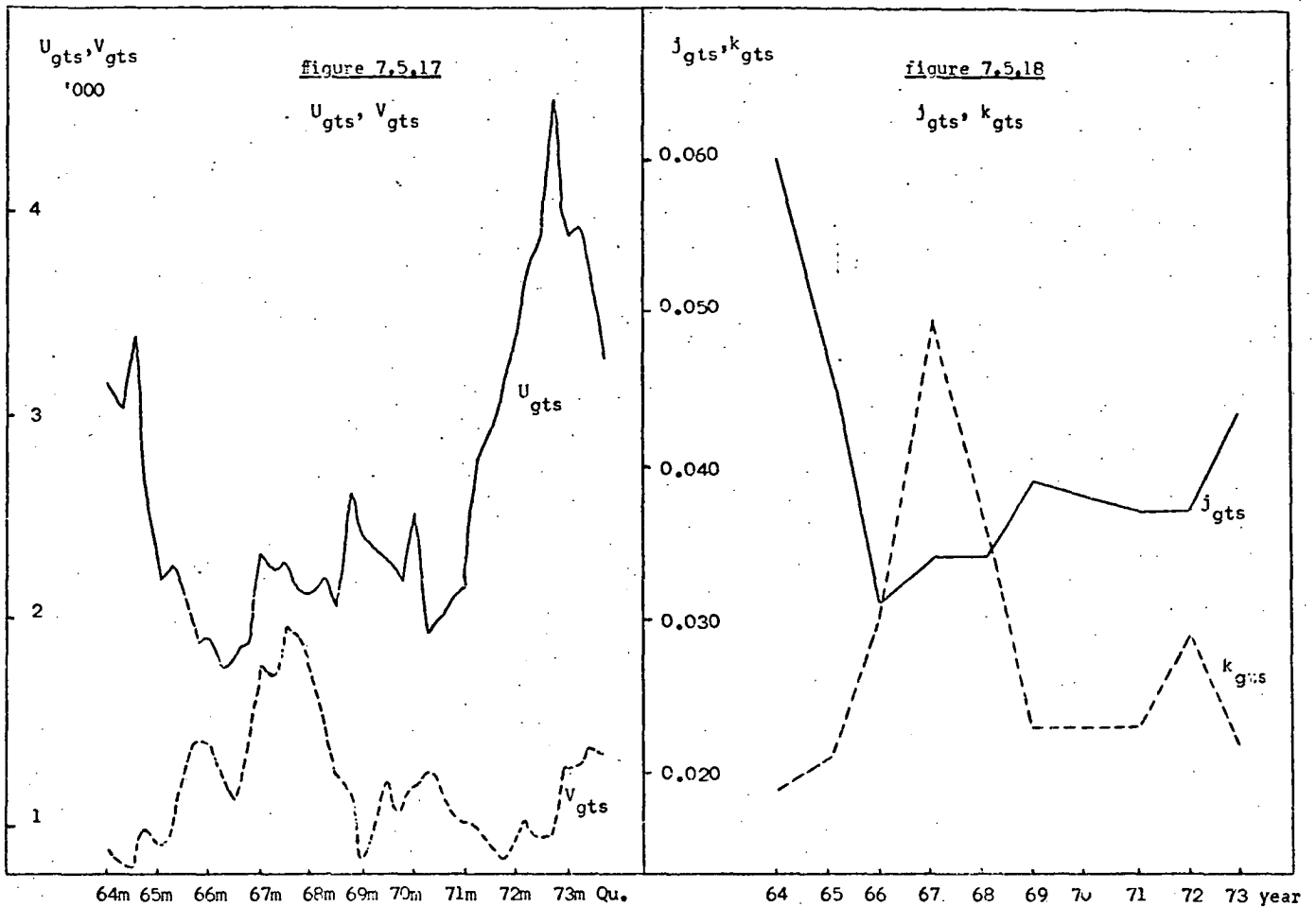


Table 7.5.9

H.9 Equations : Tasmania.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
H.9.1	$U_{gts} = 2864 - 0.731V_{gts} + 32t'$ (7.230) (2.493) (4.194)	0.368	0.361
H.9.2	$U_{gts} = 3299 - 0.773V_{gts} + 240D_2 + 1532D_4 - 9t'$ (11.839) (3.932) (0.935) (6.448) (0.694)	0.719	0.981
H.9.3	$U_{gts} = 3456 - 0.933V_{gts} + 0.143D_2V_{gts} + 1.199D_4V_{gts} - 4t'$ (10.415) (3.805) (0.861) (6.178) (0.384)	0.686	0.904
H.9.4	$U_{gts} = 3469 - 0.992V_{gts} - 542D_2 + 0.471D_2V_{gts} + 2185D_4 - 0.692D_4V_{gts} + 4t'$ (8.100) (2.373) (0.472) (0.630) (2.126) (0.720) (0.188)	0.708	0.979
H.9.5	$\bar{U}_{gts} = 10.344 - 0.387\bar{V}_{gts} + 0.012t'$ (11.489) (3.037) (4.291)	0.397	0.425
H.9.6	$\bar{U}_{gts} = 10.617 - 0.407\bar{V}_{gts} + 0.102D_2 + 0.518D_4 - 0.003t'$ (16.499) (4.488) (1.084) (5.891) (0.657)	0.698	1.017
H.9.7	$\bar{j}_{gts} = 10.720 - 0.422\bar{V}_{gts} + 0.015D_2\bar{V}_{gts} + 0.373D_4\bar{V}_{gts} - 0.003t'$ (16.451) (4.596) (1.149) (5.987) (0.693)	0.700	1.020
H.9.8	$\bar{U}_{gts} = 11.233 - 0.505\bar{V}_{gts} - 1.225D_2 + 0.180D_2\bar{V}_{gts} + 0.637D_4 - 0.023D_4\bar{V}_{gts} + 0.000t'$ (8.879) (2.725) (0.516) (0.562) (0.219) (0.055) (0.031)	0.684	1.011

the coefficient on D_4 is significantly different from zero. The significance of the 1972 dummy variables in the linear equations is probably the result of the non-linear nature of the sector's movement in 1972 since in R.9.8 the coefficients on all dummy variable are insignificant. Although the inclusion of dummy variables improves the fit of the equations, there is no clear evidence of a positional change in the unemployment-vacancy relationship for Tasmania in either 1967 or 1972. That is, Tasmania did not contribute to the changes in aggregate non demand-deficient unemployment.

Figure 7.5.18 presents graphs of the shares of Tasmania in total unemployment, j_{gts} , and in unfilled vacancies, k_{gts} . The share of unemployment decreased from 0.060 in 1964 to 0.039 in 1969 and then increased to 0.044 in 1973; the share of unfilled vacancies increased markedly to 1967, but then decreased to levels similar to those experienced in 1964-65. In the period 1964-73, Tasmania generally moved towards an improved balance between shares of unemployment and unfilled vacancies.

7.5.10 Summary

The preferred form of the unemployment - vacancy relationship, the log-linear equation including both shift and slope dummy variables, is used as a basis for presenting comparative unemployment - vacancy equations for geographical sectors in table 7.5.19.

The coefficient on \bar{V}_1 is significantly different from zero for all geographical sectors with the exception of the Sydney metropolitan area. The 1967 dummy variables are only significantly different from zero for non-metropolitan Queensland and Western Australia and both shifts in position reflect an increase in non demand-deficient unemployment, the opposite of the change in the aggregate labour market.

Table 7.5.19

Comparative $\bar{U}_i - \bar{V}_i$ Relationships
(geographical sectors)

\bar{U}_i	\bar{V}_i	D_2	$D_2 \bar{V}_i$	D_5	$D_5 \bar{V}_i$	t'	\bar{R}^2	D.W.S.
gsy	-0.415 (0.666)	3.431 (0.494)	-0.356 (0.475)	-0.615 (0.133)	0.073 (0.152)	0.015 (0.999)	0.232	2.293
gns	-0.418 (2.197)	3.029 (1.148)	-0.383 (1.211)	-5.275 (2.203)	0.680 (2.358)	0.013 (3.343)	0.825	1.079
gmn	-0.953 (4.264)	2.525 (0.931)	-0.293 (1.028)	-4.998 (2.373)	0.551 (2.452)	0.019 (4.380)	0.867	0.681
gvc	-0.634 (3.947)	-0.102 (0.058)	0.016 (0.072)	-4.029 (2.391)	0.560 (2.564)	0.006 (1.613)	0.908	1.042
gbr	-1.048 (4.187)	-4.005 (1.285)	0.512 (1.226)	0.769 (0.363)	-0.059 (0.218)	-0.005 (0.711)	0.563	0.840
gqu	-0.615 (6.867)	-3.172 (2.286)	0.438 (2.194)	-1.182 (0.894)	0.181 (0.983)	-0.002 (0.524)	0.724	2.216
gwa	-0.877 (14.308)	-2.204 (2.689)	0.271 (2.755)	1.706 (1.996)	-0.184 (1.711)	0.030 (9.442)	0.970	1.198
gsa	-0.599 (7.953)	2.009 (1.494)	-0.274 (1.563)	-2.815 (2.356)	0.390 (2.685)	0.023 (5.126)	0.937	1.706
gts	-0.505 (2.725)	-1.225 (0.516)	0.180 (0.562)	0.637 (0.219)	-0.023 (0.055)	0.000 ...	0.684	1.011

In 1972 there were significant postional changes of the unemployment-vacancy relationships for non-metropolitan N.S.W., Melbourne, non-metropolitan Victoria, Western Australia and South Australia. The changes in these sectors, with the exception of Western Australia, would have contributed to the increase in non demand-deficient unemployment observed in 1972.

Comparative shares of unemployment and unfilled vacancies for geographical sectors are presented in table 7.5.20 for the years 1964, 1969 and 1973. Between both 1964 and 1969 and 1969 and 1973 there were movements along sectoral unemployment-vacancy relationships towards balance in four sectors and away from balance in five

Table 7.5.20

Comparative Shares of U and V
(geographical sectors)

	1964		1969		1973	
	j_i	k_i	j_i	k_i	j_i	k_i
gsy	0.161	0.237	0.157	0.302	0.126	0.300
gns	0.211	0.100	0.174	0.095	0.229	0.101
gmh	0.123	0.320	0.152	0.289	0.150	0.263
gvc	0.074	0.083	0.100	0.053	0.111	0.054
gbr	0.066	0.065	0.060	0.037	0.034	0.075
gqu	0.117	0.049	0.136	0.021	0.094	0.034
gwa	0.101	0.033	0.066	0.111	0.095	0.064
gsa	0.088	0.095	0.115	0.067	0.117	0.088
gts	0.060	0.019	0.039	0.023	0.044	0.021

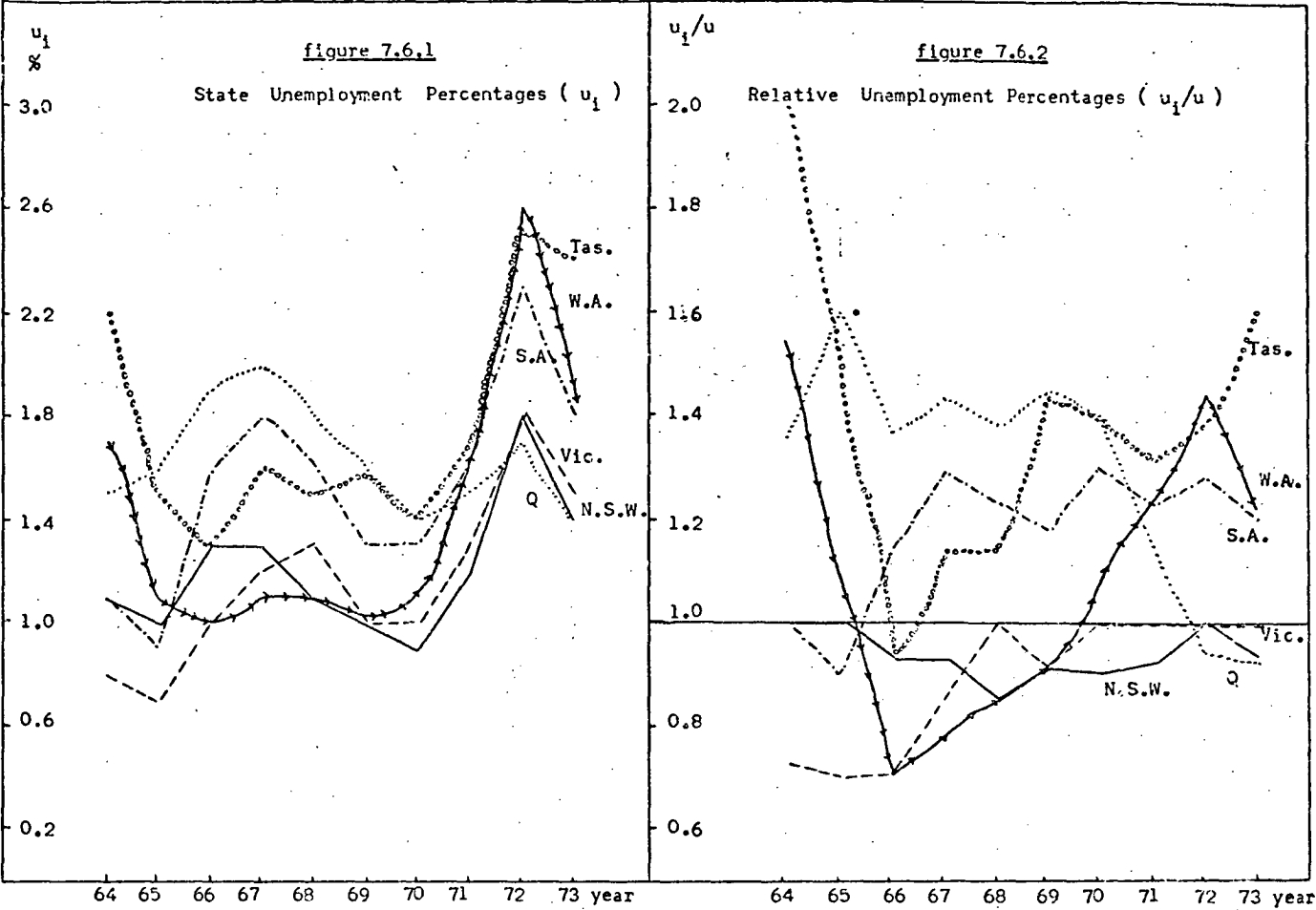
sectors. This means that the net effect of movements along sectoral relationships would not have greatly affected the position of the aggregate relationship, and thus the level of non demand-deficient unemployment, in the period 1964-73. The imbalance in the labour market at any point in time is reflected in the fact that in 1973 two thirds of unfilled vacancies were in the three largest Australian cities compared with only one third of unemployment.

7.6 Regions : Structure of Unemployment

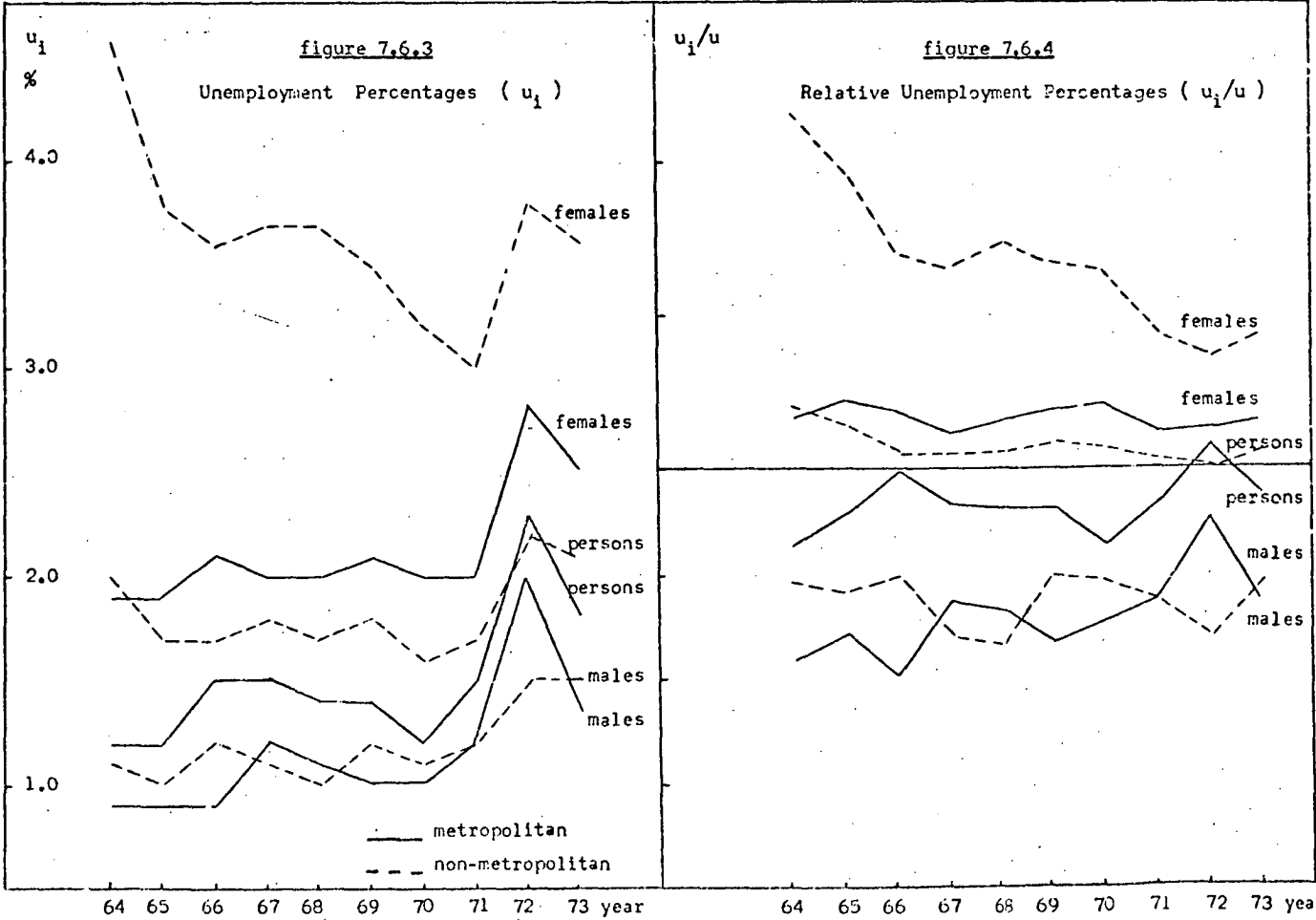
C.E.S. data on State unemployment percentages(u_i) together with unemployment percentages expressed as a ratio of the national unemployment percentage (u_i/u) are presented graphically in figures 7.6.1 and 7.6.2 respectively.

Figure 7.6.1 indicates a general convergence of State unemployment percentages in the period 1964-73, with the exception of Tasmania. In

C.E.S. UNEMPLOYMENT : STATES



L.F.S. UNEMPLOYMENT : METROPOLITAN, NON-METROPOLITAN



1964 State unemployment percentages varied from 0.8 in Victoria to 2.2 in Tasmania, a range of 1.4 percentage points between the highest and lowest percentages; in 1969 there was a variation between highest and lowest of only 0.6 percentage points; excluding Tasmania, there was a difference of only 0.4 percentage points between State unemployment percentages in 1973.

Figure 7.6.2 presents the relative unemployment percentages for each State. There is little variation in the relative unemployment percentage for N.S.W. in the period 1964-73; the relative unemployment percentage for Victoria increased while that for Queensland decreased, both these change representing movement towards reduced dispersion of State unemployment percentages. The relative unemployment percentage for South Australia increased in the early part of the period and then remained at about the same level from 1967 to 1973; the relative unemployment percentages for both W.A. and Tasmania decreased to 1966, but then generally increased for the rest of the period. Giving the appropriate weighting to the changes in relative unemployment percentages for the larger States, it is apparent that there was a marked reduction in the dispersion of State unemployment percentages in the period 1964-73. This factor may have contributed to the decrease in non demand-deficient unemployment in 1967 and would have offset the increase therein in 1972.

Figures 7.6.3 and 7.6.4 graphically portray Labour Force Survey data on unemployment percentages for metropolitan and other areas. Unemployment percentages for metropolitan and other areas and for males and females separately are presented in figure 7.6.3. The male unemployment percentage is similar for both metropolitan and other areas throughout the 1964-73 period; the unemployment percentage for females in other areas is in excess of that for metropolitan areas,

although a narrowing of the difference is evident. This trend is reflected in a narrowing of the difference between the unemployment percentages for persons in metropolitan and other areas.

Figure 7.6.4 presents relative unemployment percentages for metropolitan and other areas. There is no significant trend in the behaviour of the relative unemployment percentages for males in other areas and for females in metropolitan areas. There is an increasing trend in the relative unemployment percentage for males in metropolitan areas and a decreasing trend in the relative unemployment percentage for females in other areas : both these trends represent movement towards a reduction in the dispersion of unemployment percentages.

The conclusion from these results, albeit tentative, is that the dispersion of unemployment for geographical sectors decreased in the period 1964-73 and this would have tended to reduce the level of non demand-deficient unemployment. The changes would have contributed to the decrease in non demand-deficient unemployment in 1967 and would have offset the increase therein in 1972.

7.7 Occupations : Unemployment - Vacancy Relationships.

7.7.7 Professional and Clerical.

Time series for the period 1964-73 for professional and clerical unemployment, U_{opc} , and unfilled vacancies, V_{opc} , are presented graphically in figure 7.7.1. Inverse parallelism between the two series is evident and there were points of intersection in 1965-66 and 1970-71. There was an increase in the level of U_{opc} at which the series intersected as between 1965-66 and 1970-71, partly due to an increase in the labour force; the level of unfilled vacancies for the sector in 1973 did not greatly exceed that in earlier periods of high demand for labour.

PROFESSIONAL AND CLERICAL

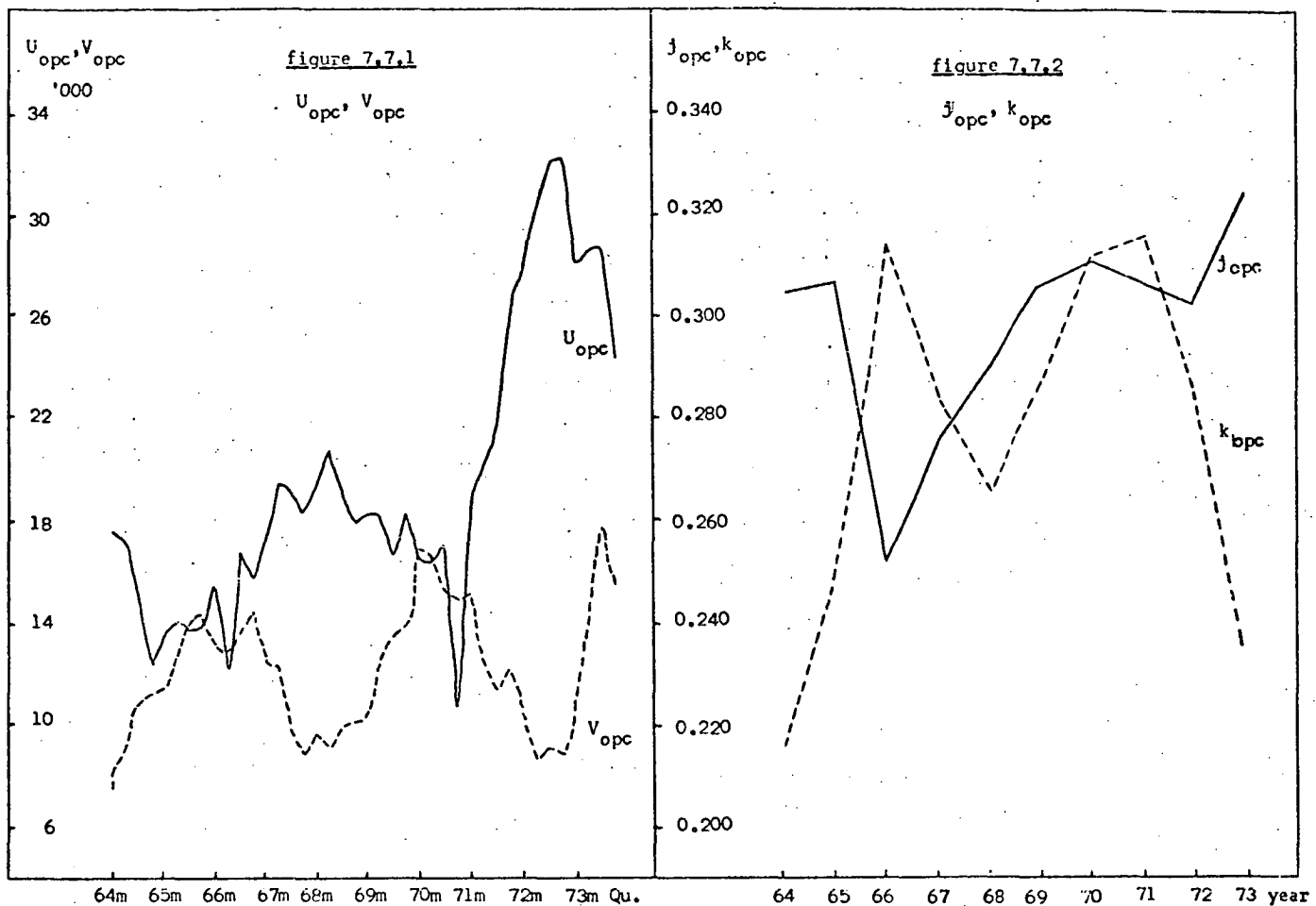


Table 7.7.1

I.1 Equations : Professional, Clerical.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.1.1	$U_{opc} = 21922 - 0.852V_{opc} + 429t'$ (11.152) (5.326) (12.214)	0.797	0.957
I.1.2	$U_{opc} = 23109 - 0.873V_{opc} - 3242D_2 + 4035D_4 + 453t'$ (15.708) (6.689) (2.413) ² (3.308) ⁴ (6.227)	0.900	2.043
I.1.3	$U_{opc} = 21932 - 0.778V_{opc} - 0.244D_2V_{opc} + 0.327D_4V_{opc} + 445t'$ (14.203) (6.533) (2.666) ² (3.976) ⁴ (7.566)	0.899	1.933
I.1.4	$U_{opc} = 24761 - 1.017V_{opc} - 4511D_2 + 0.082D_2V_{opc} + 1485D_4 + 0.189D_4V_{opc} + 470t'$ (7.711) (3.712) (1.116) ² (0.275) ² (0.418) ⁴ (0.739) ⁴ (6.161)	0.897	2.042
I.1.5	$\bar{U}_{opc} = 14.189 - 0.503\bar{V}_{opc} + 0.020t'$ (18.489) (6.120) (13.796)	0.836	1.342
I.1.6	$\bar{U}_{opc} = 14.493 - 0.534\bar{V}_{opc} - 0.145D_2 + 0.105D_4 + 0.023t'$ (19.064) (6.479) (2.086) ² (1.653) ⁴ (6.169)	0.885	2.029
I.1.7	$\bar{U}_{opc} = 14.386 - 0.522\bar{V}_{opc} - 0.015D_2\bar{V}_{opc} + 0.012D_4\bar{V}_{opc} + 0.023t'$ (19.693) (6.668) (2.040) ² (1.763) ⁴ (6.191)	0.886	2.030
I.1.8	$\bar{U}_{opc} = 15.562 - 0.648\bar{V}_{opc} - 0.522D_2 + 0.038D_2\bar{V}_{opc} - 1.979D_4 + 0.220D_4\bar{V}_{opc} + 0.025t'$ (11.048) (4.293) (0.327) ² (0.223) ² (1.320) ⁴ (1.387) ⁴ (6.411)	0.887	2.145

Estimated equations for professional and clerical occupations are presented in table 7.7.1. With respect to the linear equations the inclusion of the dummy variables improves the fit of the equation, but the coefficients on all dummy variables in I.1.4 are insignificant. Equation I.1.2 performs marginally better in terms of \bar{R}^2 and indicates a fall in non demand-deficient unemployment in 1967 and an increase in 1972, in line with changes in the aggregate labour market. The results for the log-linear equations are similar with the change in 1967 significant in I.1.6 and I.1.7, but not in I.1.8, and the change in 1972 insignificant throughout. The results in general suggest that no significant change in the sector's unemployment-vacancy relationship occurred in the period 1964-73; any change that did occur contributed to the aggregate shifts.

The sector's shares of unemployment (j_{opc}) and of unfilled vacancies (k_{opc}) are graphically portrayed in figure 7.7.2. The sector's share of unemployment was similar in 1969 to that for 1964 and then increased slightly to 1973, while the share of unfilled vacancies increased from 0.216 in 1964 to 0.287 in 1969 and then declined to 0.232 in 1973. The gap between j_{opc} and k_{opc} narrowed markedly between 1964 and 1969, but then increased to 1973 reflecting the restoration of an imbalance evident in the early part of the period. This movement away from a position of balance would have contributed to the increase in non demand-deficient unemployment in 1972.

7.7.2 Skilled Building and Construction

Time series on unemployment and unfilled vacancies for skilled building and construction occupations, U_{obc} and V_{obc} respectively, are presented graphically in figure 7.7.3. The points of intersection were at a similar level in 1964 and 1969, but then increased in 1973. Unfilled vacancies reached a higher level in 1964 than in 1973.

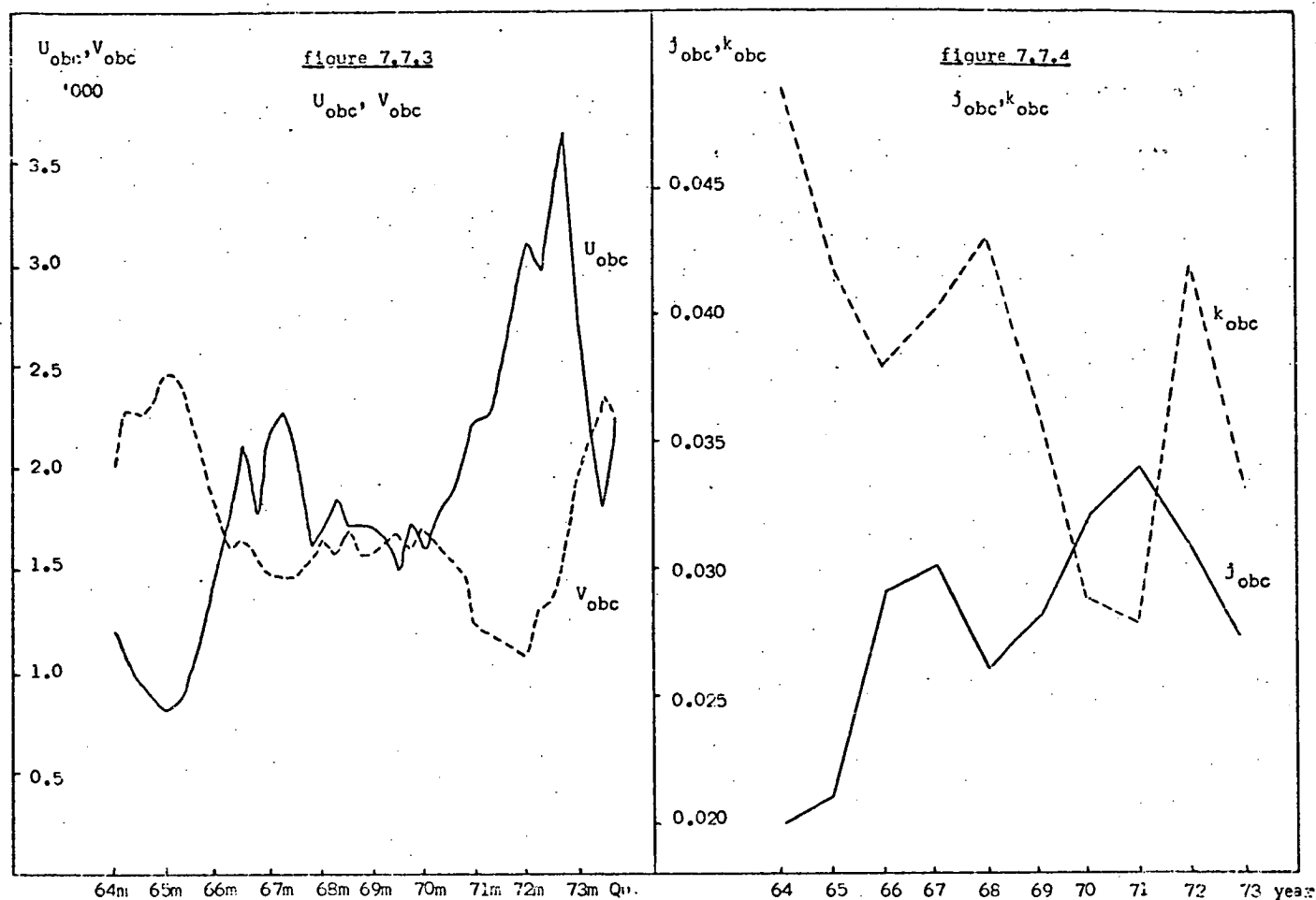


Table 7.7.2

I.2 Equations : Skilled Building and Construction.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.2.1	$U_{abc} = 2414 - 0.700V_{abc} + 34t'$ (7.275) (4.437) (6.375)	0.719	0.495
I.2.2	$U_{abc} = 3952 - 1.348V_{abc} - 398D_2 + 1052D_4 + 16t'$ (13.571) (10.519) (2.712) (5.976) (1.841)	0.897	1.836
I.2.3	$U_{abc} = 4239 - 1.468V_{abc} - 0.258D_2V_{abc} + 0.677D_4V_{abc} + 10t'$ (10.340) (8.209) (3.049) (5.870) (0.991)	0.891	1.673
I.2.4	$U_{abc} = 3855 - 1.284V_{abc} + 226D_2 - 0.357D_2V_{abc} + 694D_4 + 0.290D_4V_{abc} + 12t'$ (8.497) (6.380) (0.382) (1.105) (1.141) (0.653) (0.915)	0.895	1.893
I.2.5	$\bar{U}_{abc} = 12.734 - 0.758\bar{V}_{abc} + 0.019t'$ (12.769) (5.772) (7.183)	0.791	0.471
I.2.6	$\bar{U}_{abc} = 16.336 - 1.283\bar{V}_{abc} - 0.120D_2 + 0.508D_4 + 0.007t'$ (17.173) (10.102) (1.469) (5.012) (1.457)	0.898	1.156
I.2.7	$\bar{U}_{abc} = 17.149 - 1.322\bar{V}_{abc} - 0.013D_2\bar{V}_{abc} + 0.73D_4\bar{V}_{abc} + 0.005t'$ (16.905) (10.078) (1.158) (5.257) (0.990)	0.900	1.238
I.2.8	$\bar{U}_{abc} = 21.776 - 1.929\bar{V}_{abc} - 5.283D_2 + 0.701D_2\bar{V}_{abc} - 2.064D_4 + 0.355D_4\bar{V}_{abc} - 0.000t'$ (16.957) (11.570) (3.505) (3.483) (0.988) (1.220) (0.083)	0.939	2.162

Estimated unemployment-vacancy relationships for the skilled building and construction sector are presented in table 7.7.2. With respect to the linear equations the best fitting equation is I.2.2 in which the coefficients on the 1967 and 1972 dummy variables are both significantly different from zero. The indicated changes are in line with shifts in the aggregate relationship. The slope dummy variables are significant in I.2.3, but when both shift and slope dummy variables are included the coefficients on all dummy variables are insignificant.

The best-fitting non-linear equation is I.2.8 with an \bar{R}^2 of 0.939; the coefficients on both shift and slope dummy variables in 1967 are significant and show a decrease in the elasticity of unemployment with respect to unfilled vacancies as from 1967, a change contrary to the change in the aggregate relationship at that time; the coefficients on the 1972 dummy variables and t' are not significantly different from zero. The results thus indicate that the sector did not contribute significantly to the increase in non demand-deficient unemployment in 1972 and offset, in part, the decrease therein in 1967.

Figure 7.7.4 graphically portrays the shares of the sector in total unemployment (j_{obc}) and unfilled vacancies (k_{obc}). The sector's share of unemployment increased from 0.020 in 1964 to 0.028 in 1969 and then decreased slightly to 0.027 in 1973, while the share of unfilled vacancies decreased from 0.049 in 1964 to 0.037 in 1969 and to 0.034 in 1973. This represented a narrowing of the gap between j_{obc} and k_{obc} , a movement towards a more even distribution of unemployment and unfilled vacancies in the labour market.

7.7.3 Skilled Metal and Electrical

Time series on unemployment and unfilled vacancies for skilled

metal and electrical, U_{ome} and V_{ome} respectively, are presented graphically in figure 7.7.5. The inverse parallelism between the two series is clouded by the apparent time trend convergence between U_{ome} and V_{ome} . Unfilled vacancies for the sector were very much in excess of unemployment until 1971-72 and the two series intersected only at that time.

Estimated unemployment-vacancy equations for the skilled metal and electrical sector are presented in table 7.7.3. The best fitting linear equation is I.3.4 with an \bar{R}^2 of 0.867 and D.W.S. of 1.716. In this equation the coefficient on the 1972 shift dummy is marginally significant while the coefficients on the other dummy variables are insignificant. With respect to the log-linear equations the inclusion of dummy variables only marginally improves the goodness of fit. In equation I.3.8 the coefficients on both 1967 dummy variables are significant and suggest a decrease in elasticity and an associated increase in non demand-deficient unemployment for the sector - an opposite movement to that for the aggregate relationship. The coefficients on the 1972 dummy variables are insignificant.

The data on the sector's share of unemployment, j_{ome} , and of unfilled vacancies, k_{ome} , are presented graphically in figure 7.7.6. It is readily apparent that there has been a marked narrowing of the gap between j_{ome} and k_{ome} in the period 1964-73, although there was some increase in the gap in 1973. Although the sector's unemployment-vacancy relationship moved outwards in 1967, the movement towards a position of balance in the sector would have contributed to an inwards shift of the aggregate relationship with an associated reduction in aggregate non demand-deficient unemployment.

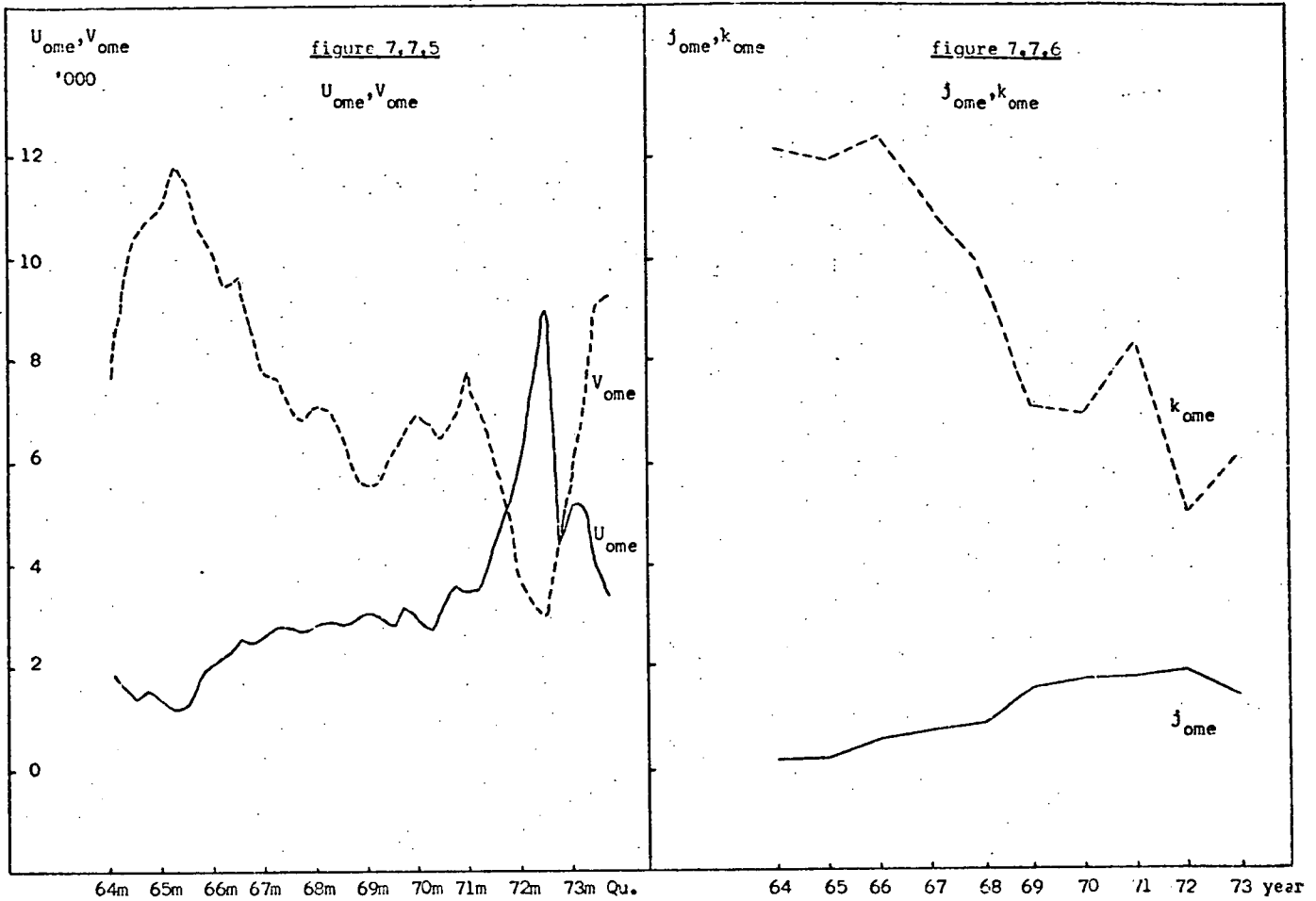


Table 7.7.3

I.3 Equations : Skilled Metal and Electrical.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.3.1	$U_{ome} = 4980 - 0.384V_{ome} + 59t'$ (5.510) (4.484) (3.600)	0.728	0.899
I.3.2	$U_{ome} = 6801 - 0.539V_{ome} - 1421D_2 + 1092D_4 + 63t'$ (8.624) (7.203) (2.868) (2.577) (2.690)	0.836	1.483
I.3.3	$U_{ome} = 5658 - 0.437V_{ome} - 0.240D_2V_{ome} + 0.085D_4V_{ome} + 90t'$ (6.334) (5.487) (4.866) (1.252) (3.790)	0.845	1.648
I.3.4	$U_{ome} = 3630 - 0.230V_{ome} + 977D_2 - 0.264D_2V_{ome} + 2269D_4 - 0.241D_4V_{ome} + 8t'$ (2.922) (1.892) (0.601) (1.326) (1.898) (1.217) (3.639)	0.867	1.716
I.3.5	$\bar{U}_{ome} = 14.305 - 0.758\bar{V}_{ome} + 0.020t'$ (16.390) (8.032) (7.813)	0.907	0.979
I.3.6	$\bar{U}_{ome} = 15.102 - 0.845\bar{V}_{ome} - 0.233D_2 - 0.017D_4 + 0.027t'$ (17.370) (8.964) (2.445) (0.200) (5.857)	0.919	1.184
I.3.7	$\bar{U}_{ome} = 14.871 - 0.820\bar{V}_{ome} - 0.025D_2\bar{V}_{ome} - 0.002D_4\bar{V}_{ome} + 0.027t'$ (17.482) (8.916) (2.349) (0.157) (5.655)	0.918	1.166
I.3.8	$\bar{U}_{ome} = 19.650 - 1.340\bar{V}_{ome} - 7.026D_2 + 0.752D_2\bar{V}_{ome} + 2.047D_4 - 0.235D_4\bar{V}_{ome} + 0.027t'$ (8.921) (5.605) (2.605) (2.517) (1.008) (0.998) (5.623)	0.928	1.392

7.7.4 Other Skilled

Time series on unemployment and unfilled vacancies for the other skilled sector, U_{oos} and V_{oos} respectively, are presented in figure 7.7.4. Inverse parallelism between the two series is evident throughout the period and there were points of intersection in 1964-65, 1969-70 and 1973. The level of unemployment at which the series intersected in 1964-65 and 1969-70 were similar, but there was a substantial increase to 1973. The unfilled vacancies series reached a level in 1973 greatly in excess of any previous period in the decade 1964-73.

Estimated equations for the other skilled sector are presented in table 7.7.4. The inclusion of dummy variables improves the fit of the linear equations; the best fitting linear equation is I.4.4 and the coefficient on the 1972 dummy variable is highly significant in this equation, reflecting a decrease in the absolute slope of the relationship. The results for the log-linear equations also show a significant shift of the sectoral unemployment-vacancy relationship in 1972, but not in 1967. The best fitting equation is I.4.8 and the results for this equation indicate a decrease in the elasticity of U_{oos} with respect to V_{oos} as from 1972. The estimated equations confirm the observation from the graph that there was a large increase in the level of non demand-deficient unemployment for the other skilled sector in 1972-73.

Figure 7.7.8 graphically portrays the sector's shares of total unemployment (j_{oos}) and of total unfilled vacancies (k_{oos}). The sector's share of unemployment decreased from 0.278 in 1964 to 0.231 in 1973, while the sector's share of unfilled vacancies increased from 0.315 in 1964 to 0.389 in 1973. These trends resulted in an increasing gap between the sector's shares of unemployment and

OTHER SKILLED

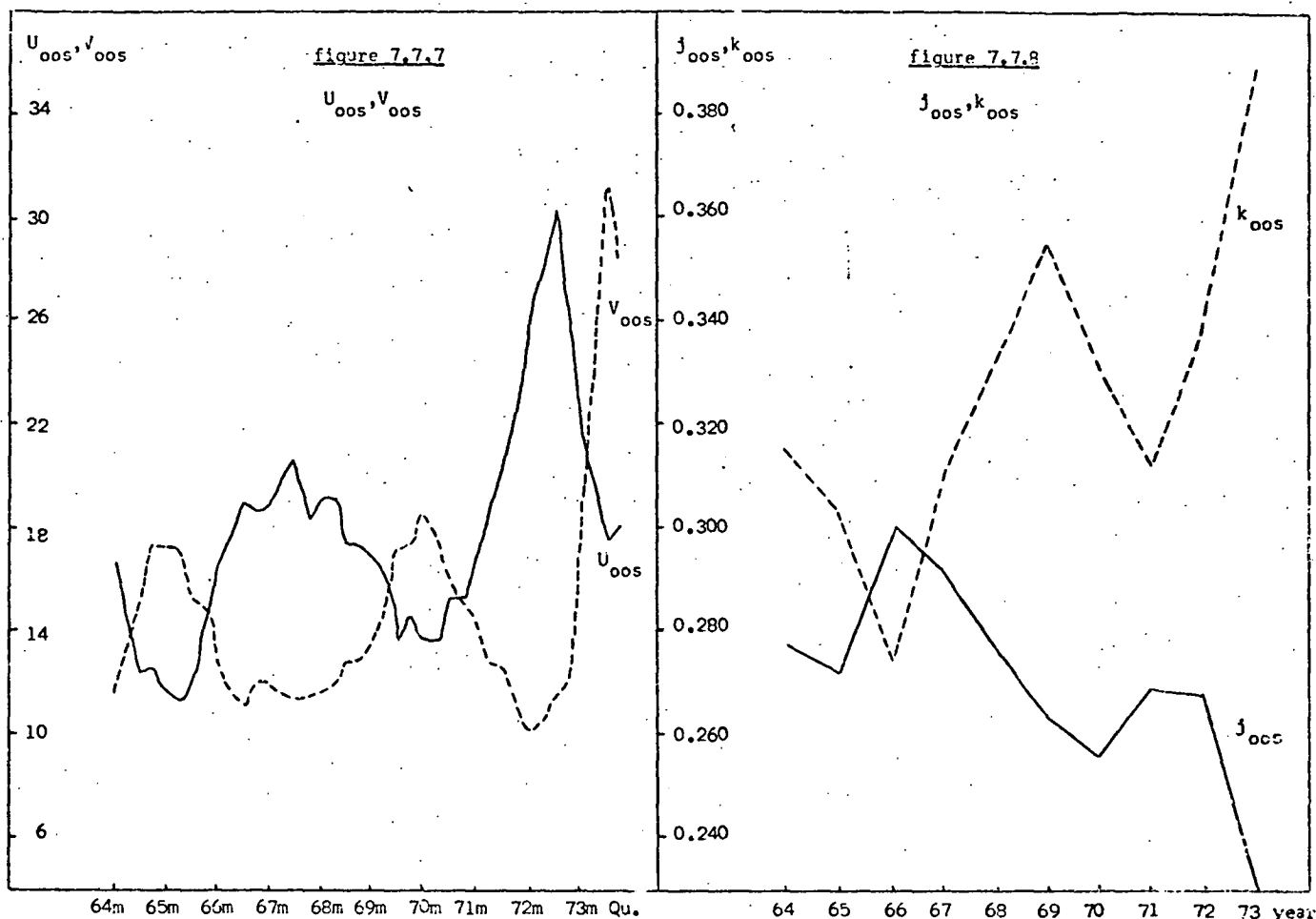


Table 7.7.4

I.4 Equations : Other Skilled.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.4.1	$U_{00s} = 21135 - 0.611V_{00s} + 300t'$ (14.700) (6.286) (8.008)	0.663	0.301
I.4.2	$U_{00s} = 24811 - 0.781V_{00s} - 1583D_2^2 + 6498D_4 + 235t'$ (24.225) (12.152) (1.462) (6.187) (4.190)	0.870	1.207
I.4.3	$U_{00s} = 28874 - 1.055V_{00s} - 0.068D_2V_{00s} + 0.471D_4V_{00s} + 193t'$ (20.473) (11.937) (1.134) (9.968) (4.482)	0.924	1.578
I.4.4	$U_{00s} = 28652 - 1.046V_{00s} + 1468D_2^2 - 0.188D_2V_{00s} - 2587D_4 + 0.617D_4V_{00s} + 208t'$ (12.921) (6.921) (0.564) (0.975) (1.235) (4.782) (4.572)	0.923	1.495
I.4.5	$\bar{U}_{00s} = 15.445 - 0.626\bar{V}_{00s} + 0.016t'$ (21.606) (8.281) (9.515)	0.760	0.309
I.4.6	$\bar{U}_{00s} = 16.509 - 0.731\bar{V}_{00s} - 0.066D_2^2 + 0.282D_4 + 0.012t'$ (34.267) (14.436) (1.310) (5.839) (4.789)	0.901	1.074
I.4.7	$\bar{U}_{00s} = 16.654 - 0.746\bar{V}_{00s} - 0.006D_2\bar{V}_{00s} + 0.031\bar{V}_{00s} + 0.012t'$ (35.175) (15.026) (1.105) (6.306) (4.607)	0.908	1.134
I.4.8	$\bar{U}_{00s} = 19.480 - 1.041\bar{V}_{00s} - 0.584D_2^2 + 0.059D_2\bar{V}_{00s} - 4.134D_4 + 0.462D_4\bar{V}_{00s} + 0.010t'$ (24.677) (12.612) (0.588) (0.563) (5.670) (6.082) (5.548)	0.960	1.974

unfilled vacancies : a growing imbalance in the labour market which contributed to an increase in non demand-deficient unemployment for the aggregate labour market.

7.7.5 Unskilled Manual

Figure 7.7.9 presents graphs of unskilled manual unemployment (U_{oum}) and unfilled vacancies (V_{oum}) for the period 1964-73. Inverse parallelism between the two series is evident, but there were no points of intersection between the two series in the period 1964-73. The unfilled vacancies series for the sector exhibited only a small increase in the period of high demand for labour in 1969-70.

Estimated equations for the unskilled manual sector are presented in table 7.5.5. With respect to the linear equations, I.5.1 to I.5.4, the inclusion of dummy variables improves the fit of the equations and the coefficients on all dummy variables are significant. The signs of the coefficients reflect shifts in accord with changes for the aggregate relationship; the changes differ from those for the aggregate equation in that the variation in the absolute slope is greater in 1967 than in 1972. The results for the log-linear equations are similar and again the coefficients on all dummy variables tested are significantly different from zero. There was an increase in the elasticity of U_{oum} with respect to V_{oum} in 1967 and an associated decrease in non demand-deficient unemployment which would have contributed to the aggregate decrease therein. Similarly, the increase in non demand-deficient unemployment for the sector in 1972 would have contributed to the aggregate increase at that time.

Figure 7.7.10 graphically portrays the sector's shares of unemployment (j_{oum}) and of unfilled vacancies (k_{oum}). The share of unemployment increased in the period from 0.155 in 1964 to 0.204 in

UNSKILLED MANUAL

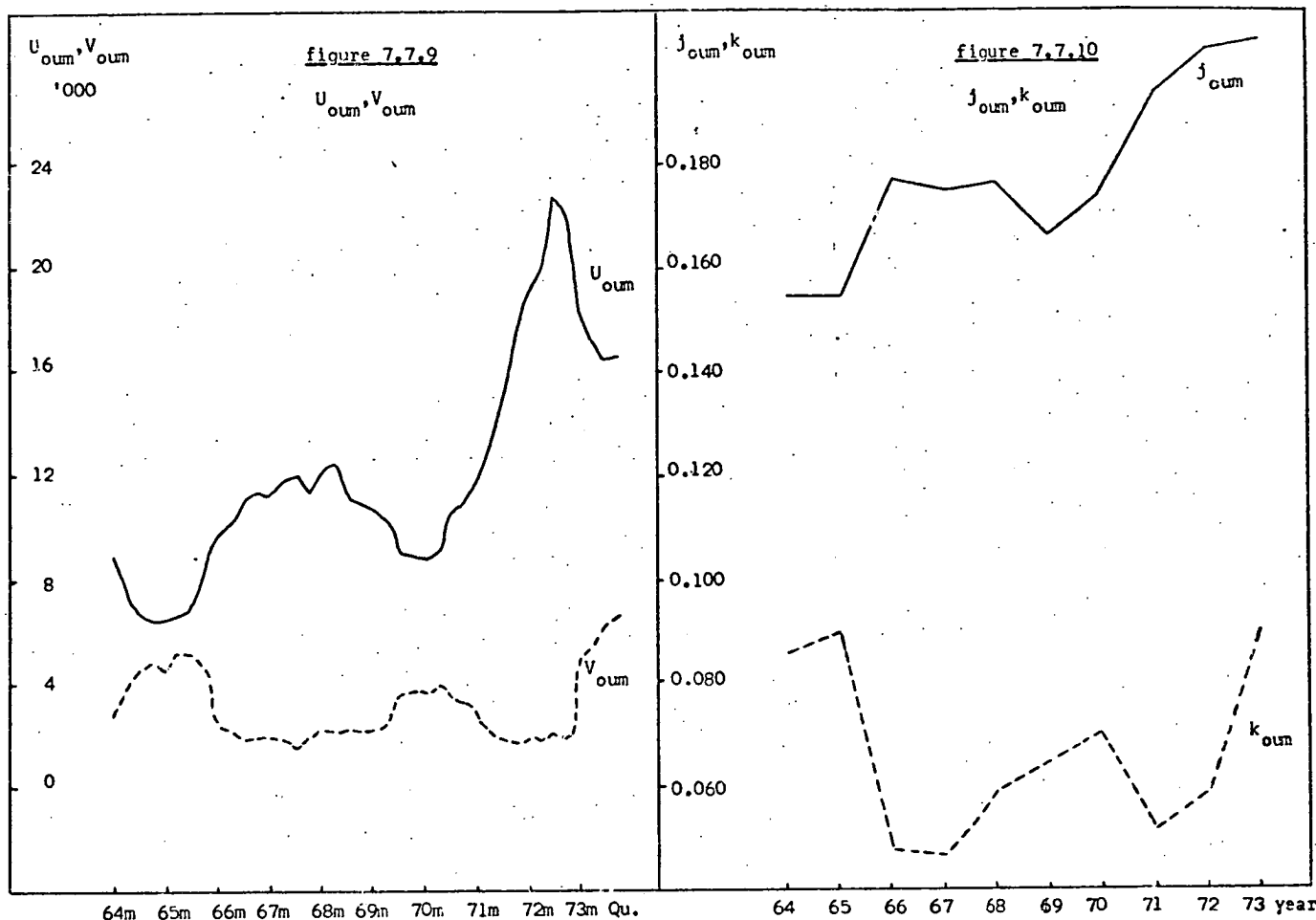


Table 7.7.5

I.5 Equations : Unskilled Manual.

Equation No.	E Q U A T I O N	R^2	D.W.S.
I.5.1	$U_{oum} = 8609 - 0.775V_{oum} + 301t'$ (7.843) (2.981) (9.300)	0.700	0.152
I.5.2	$U_{oum} = 12255 - 1.455V_{oum} - 1951D_2 + 6528D_4 + 230t'$ (17.623) (9.260) (2.313) ² (7.844) ⁴ (5.304)	0.917	1.299
I.5.3	$U_{oum} = 10646 - 1.154V_{oum} - 1.540D_2V_{oum} + 1.592D_4V_{oum} + 351t'$ (11.731) (5.493) (6.907) ² (8.975) ⁴ (9.683)	0.933	0.979
I.5.4	$U_{oum} = 10057 - 0.904V_{oum} + 2205D_2 - 1.784D_2V_{oum} + 2543D_4 + 1.276D_4V_{oum} + 28t'$ (11.521) (4.268) (2.038) ² (4.823) ² (2.054) ⁴ (3.703) ⁴ (7.543)	0.949	1.639
I.5.5	$\bar{U}_{oum} = 11.192 - 0.292\bar{V}_{oum} + 0.024t'$ (24.582) (5.135) (11.647)	0.806	0.182
I.5.6	$\bar{U}_{oum} = 12.236 - 0.411\bar{V}_{oum} - 0.127D_2 + 0.393D_4 + 0.020t'$ (44.510) (12.147) (2.261) ² (7.148) ⁴ (6.841)	0.941	1.335
I.5.7	$\bar{U}_{oum} = 12.320 - 0.421\bar{V}_{oum} - 0.016D_2\bar{V}_{oum} + 0.05D_4V_{oum} + 0.019t'$ (45.920) (12.835) (2.248) ² (7.743) ⁴ (6.683)	0.947	1.420
I.5.8	$\bar{U}_{oum} = 12.164 - 0.402\bar{V}_{oum} + 1.292D_2 - 0.182D_2\bar{V}_{oum} - 2.015D_4 + 0.302D_4\bar{V}_{oum} + 0.020t'$ (30.519) (8.272) (2.218) ² (2.414) ² (3.464) ⁴ (4.150) ⁴ (7.459)	0.959	1.446

1973; at the same time the sector's share of unfilled vacancies decreased from 0.086 in 1964 to 0.065 in 1969 and then increased to 0.090 in 1973. These trends mean that in the period 1964-73 the gap between j_{oum} and k_{oum} increased, reflecting a deterioration in the distribution of unemployment and unfilled vacancies in the labour market.

7.7.6 Service Occupations

Figure 7.7.11 presents time series on unemployment (U_{oso}) and unfilled vacancies (V_{oso}) for service occupations. The two series did not intersect at any time in the period under observation. It is interesting to note that the unfilled vacancies series did not fall as low in 1972 as it had in 1967-68.

Estimated equations for service occupations are presented as equations I.6.1 to I.6.8 in table 7.7.6. The inclusion of dummy variables improves the fit of the equations, but the D.W.S. indicates that first order serial correlation is present in the residuals. In the linear equations the coefficients on the 1967 dummy variables are insignificant while those on the 1972 dummy variables suggest a decrease in the absolute slope of the relationship, a similar shift to that for the aggregate equation. With respect to the log-linear equations, I.6.5 to I.6.8, the results are similar with insignificant coefficients on the 1967 dummy variables and significant coefficients for 1972. The signs of the 1972 coefficients indicate a decrease in elasticity and an associated increase in non demand-deficient unemployment for the sector, thus contributing to the aggregate increase.

Figure 7.7.12 graphically portrays the shares of service occupations in total unemployment (j_{oso}) and in total unfilled vacancies (k_{oso}). The sector's share of unemployment decreased from 0.181 in

SERVICE OCCUPATIONS

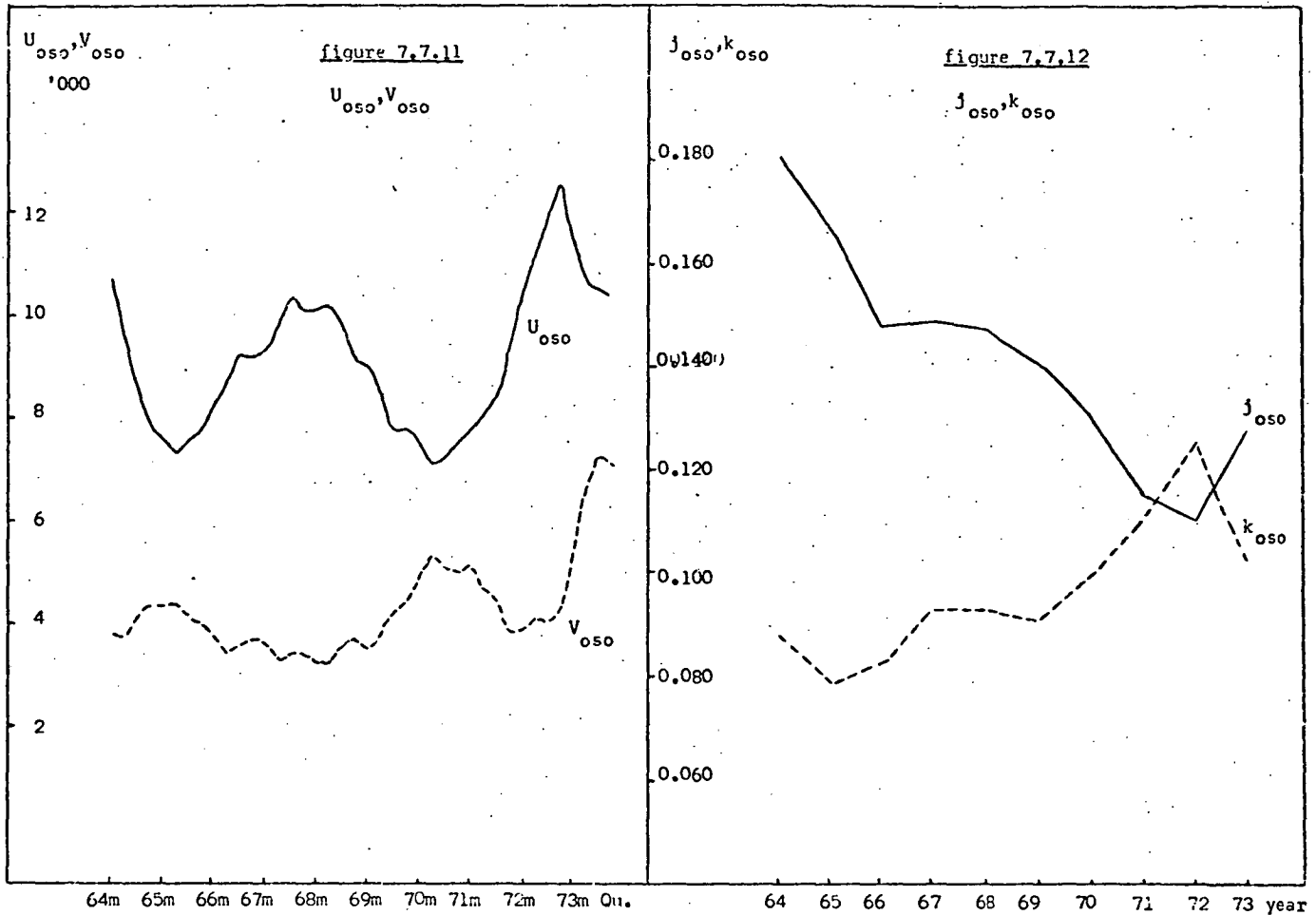


Table 7.7.6

I.6 Equations : Service Occupations.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.6.1	$U_{oso} = 10093 - 0.534V_{oso} + 72t'$ (10.489) (2.946) ^{oso} (3.297)	0.186	0.140
I.6.2	$U_{oso} = 12549 - 0.974V_{oso} + 409D_2 + 3930D_4 - 6t'$ (19.661) (5.841) ^{oso} (0.796) ² (8.117) ⁴ (0.201)	0.723	0.723
I.6.3	$U_{oso} = 14917 - 1.585V_{oso} + 0.148D_2V_{oso} + 0.834D_4V_{oso} - 7t'$ (21.198) (9.407) ^{oso} (1.324) ² (11.090) ⁴ (0.309)	0.820	0.847
I.6.4	$U_{oso} = 17549 - 2.253V_{oso} - 2578D_2 + 0.815D_2V_{oso} - 758D_4 + 0.968D_4V_{oso} - 9t'$ (8.534) (4.438) ^{oso} (1.172) ² (1.342) ² (0.520) ⁴ (3.477) ⁴ (0.343)	0.823	0.894
I.6.5	$\bar{U}_{oso} = 11.948 - 0.259\bar{V}_{oso} + 0.008t'$ (11.110) (2.720) ^{oso} (3.612)	0.230	0.126
I.6.6	$\bar{U}_{oso} = 13.659 - 0.556\bar{V}_{oso} + 0.026D_2 + 0.401D_4 + 0.001t'$ (19.973) (6.654) ^{oso} (0.490) ² (7.952) ⁴ (0.201)	0.737	0.693
I.6.7	$\bar{U}_{oso} = 13.860 - 0.580\bar{V}_{oso} + 0.004D_2\bar{V}_{oso} + 0.043D_4\bar{V}_{oso} + 0.000t'$ (21.051) (7.218) ^{oso} (0.586) ² (8.323) ⁴ (0.118)	0.752	0.719
I.6.8	$\bar{U}_{oso} = 17.163 - 0.980\bar{V}_{oso} - 2.108D_2 + 0.261D_2\bar{V}_{oso} - 3.726D_4 + 0.496D_4\bar{V}_{oso} - 0t'$ (9.320) (4.558) ^{oso} (0.975) ² (0.935) ² (3.031) ⁴ (3.431) ⁴ (0.015)	0.820	0.803

1964 to 0.128 in 1973, while the sector's share of unfilled vacancies increased from 0.088 in 1964 to 0.103 in 1973. This meant a narrowing of the gap between j_{oso} and k_{oso} in the period 1964-73 and a position of balance was attained in the period 1971-73. This trend would tend to reduce aggregate non demand-deficient unemployment.

7.7.7 Rural Occupations

Time series on U_{oru} and V_{oru} for the period 1964-73 are presented in figure 7.7.13. Inverse parallelism is not apparent for the sector and both the unemployment and unfilled vacancies series are subject to a large degree of irregular movement. The series intersected in 1964-65 only.

Estimated unemployment-vacancy equations for rural occupations are presented in table 7.7.7. The inclusion of dummy variables results in a small improvement in goodness of fit; although the value of \bar{R}^2 remains relatively low, the D.W.S. indicates that first order serial correlation is not present in the residuals. The best-fitting linear equation, I.7.3, suggests a decrease in the absolute slope of the relationship with an associated increase in non demand-deficient unemployment for the sector. The log-linear equations, however, indicate that the significance of this change is the result of non-linearity and it is concluded that no change in the unemployment-vacancy relationship for rural occupations occurred in the 1964-73 period.

Figure 7.7.14 graphically portrays the sector's shares of unemployment (j_{oru}) and of unfilled vacancies (k_{oru}). In the period 1964-73 the sector initially moved away from a position of balance and, after a considerable gap between j_{oru} and k_{oru} persisted for a number of years, moved again towards balance. The overall impact on aggregate non demand-deficient unemployment would have been small.

RURAL OCCUPATIONS

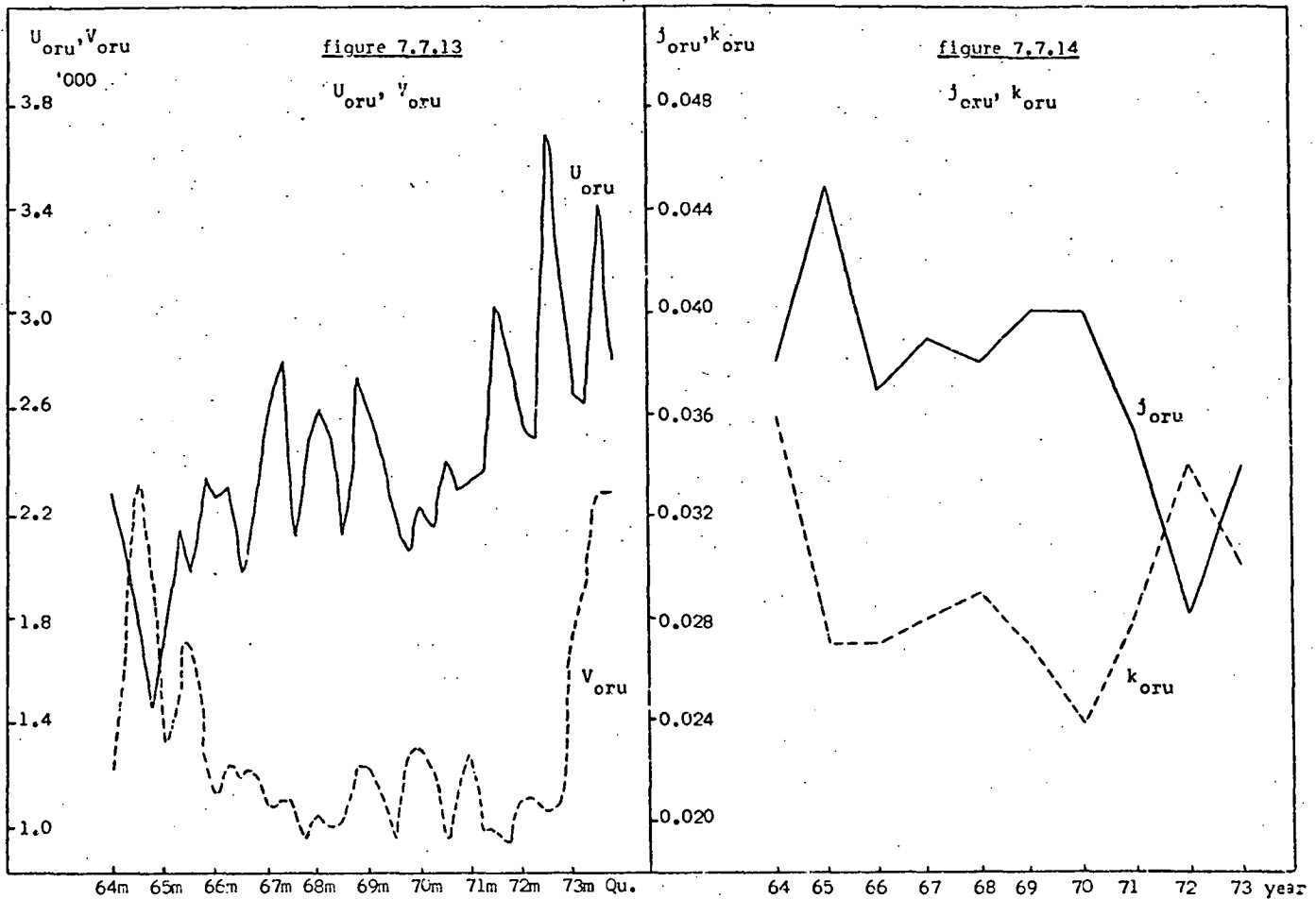


Table 7.7.7

I.7 Equations : Rural Occupations.

Equation No.	E Q U A T I O N	\bar{R}^2	D.W.S.
I.7.1	$U_{oru} = 2108 - 0.116V_{oru} + 25t'$ (10.340) (0.905) (5.519)	0.437	1.461
I.7.2	$U_{oru} = 2577 - 0.361V_{oru} - 142D_2 + 540D_4 + 17t'$ (10.676) (2.557) (0.700) (2.557) (1.651)	0.533	1.954
I.7.3	$U_{oru} = 2815 - 0.503V_{oru} - 0.111D_2V_{oru} + 0.450D_4V_{oru} + 13t'$ (9.032) (2.929) (0.726) (3.283) (1.219)	0.552	2.104
I.7.4	$U_{oru} = 2823 - 0.508V_{oru} - 26D_2 - 0.092D_2V_{oru} + 3D_4 + 0.442D_4V_{oru} + 13t'$ (7.952) (2.401) (0.040) (0.164) (0.005) (0.780) (1.140)	0.525	2.099
I.7.5	$\bar{U}_{oru} = 8.417 - 0.116\bar{V}_{oru} + 0.010t'$ (15.131) (1.504) (5.591)	0.464	1.363
I.7.6	$\bar{U}_{oru} = 9.514 - 0.261\bar{V}_{oru} - 0.064D_2 + 0.201D_4 + 0.007t'$ (14.977) (3.014) (0.779) (2.371) (1.770)	0.545	1.795
I.7.7	$\bar{U}_{oru} = 9.561 - 0.272\bar{V}_{oru} - 0.008D_2\bar{V}_{oru} + 0.030D_4\bar{V}_{oru} + 0.007t'$ (14.853) (3.089) (0.659) (2.516) (1.556)	0.549	1.825
I.7.8	$\bar{U}_{oru} = 10.653 - 0.416\bar{V}_{oru} - 1.139D_2 + 0.154D_2\bar{V}_{oru} - 0.977D_4 + 0.165D_4\bar{V}_{oru} + 0.005t'$ (10.824) (3.106) (0.615) (0.534) (0.519) (0.620) (1.052)	0.552	1.976

7.7.8 Summary

Comparative log-linear unemployment - vacancy equations for occupational sectors are presented in table 7.7.8 (constant terms not included). The coefficient on \bar{V}_i is negative and significantly different from zero for each sector.

Table 7.7.8

Comparative $\bar{U}_i - \bar{V}_i$ Relationships
(occupational sectors)

\bar{U}_i	\bar{V}_i	D_2	$D_2 \bar{V}_i$	D_5	$D_5 \bar{V}_i$	t'	\bar{R}^2	D.W.S.
opc	-0.648 (4.293)	-0.522 (0.327)	0.038 (0.223)	-1.979 (1.320)	0.220 (1.387)	0.025 (6.411)	0.887	2.145
cbe	-1.929 (11.570)	-5.283 (3.505)	0.701 (3.483)	-2.064 (0.988)	0.355 (1.220)	0.000 (0.083)	0.939	2.162
ome	-1.340 (5.605)	-7.026 (2.605)	0.752 (2.517)	2.047 (1.008)	-0.235 (0.998)	0.027 (5.623)	0.928	1.392
oos	-1.041 (12.612)	-0.584 (0.588)	0.059 (0.563)	-4.134 (5.670)	0.462 (6.082)	0.010 (5.548)	0.960	1.974
oum	-0.402 (8.272)	1.292 (2.218)	-0.182 (2.414)	-2.015 (3.464)	0.302 (4.150)	0.020 (7.459)	0.959	1.446
oso	-0.980 (4.558)	-2.108 (0.975)	0.261 (0.985)	-3.726 (3.081)	0.486 (3.431)	0.000 (0.015)	0.820	0.803
oru	-0.416 (3.106)	-1.139 (0.615)	0.154 (0.584)	-0.977 (0.519)	0.165 (0.620)	0.005 (1.052)	0.552	1.976

The coefficients on the 1967 dummy variables are significantly different from zero for the skilled metal and electrical, skilled building and construction and unskilled manual sectors : the elasticity of U_i with respect to V_i decreased for the two skilled sectors, with associated increases in non demand-deficient unemployment, while that for unskilled manual workers increased. Although the signs on the 1972 dummy variables indicate decreases in elasticity for all sectors except skilled metal and electrical, the coefficients are significant only for other skilled, unskilled manual and service

occupations. These three sectors contributed to the increase in aggregate non demand-deficient unemployment in 1972.

Comparative shares of total unemployment and unfilled vacancies for occupational sectors are presented in table 7.7.9. There were four movements along sectoral unemployment-vacancy relationships towards balance and three away from balance between both 1964 and 1969 and between 1969 and 1973. In the period 1964-73 there was a continued movement towards balance in the skilled building and construction, skilled metal and electrical and service occupations sectors, but these favourable trends were offset by movements away from balance in the other skilled and unskilled manual sectors. The net effect of these movements would not have significantly affected the position of the aggregate unemployment-vacancy relationship in the 1964-73 period.

Table 7.7.9

Comparative Shares of U and V
(occupational sectors)

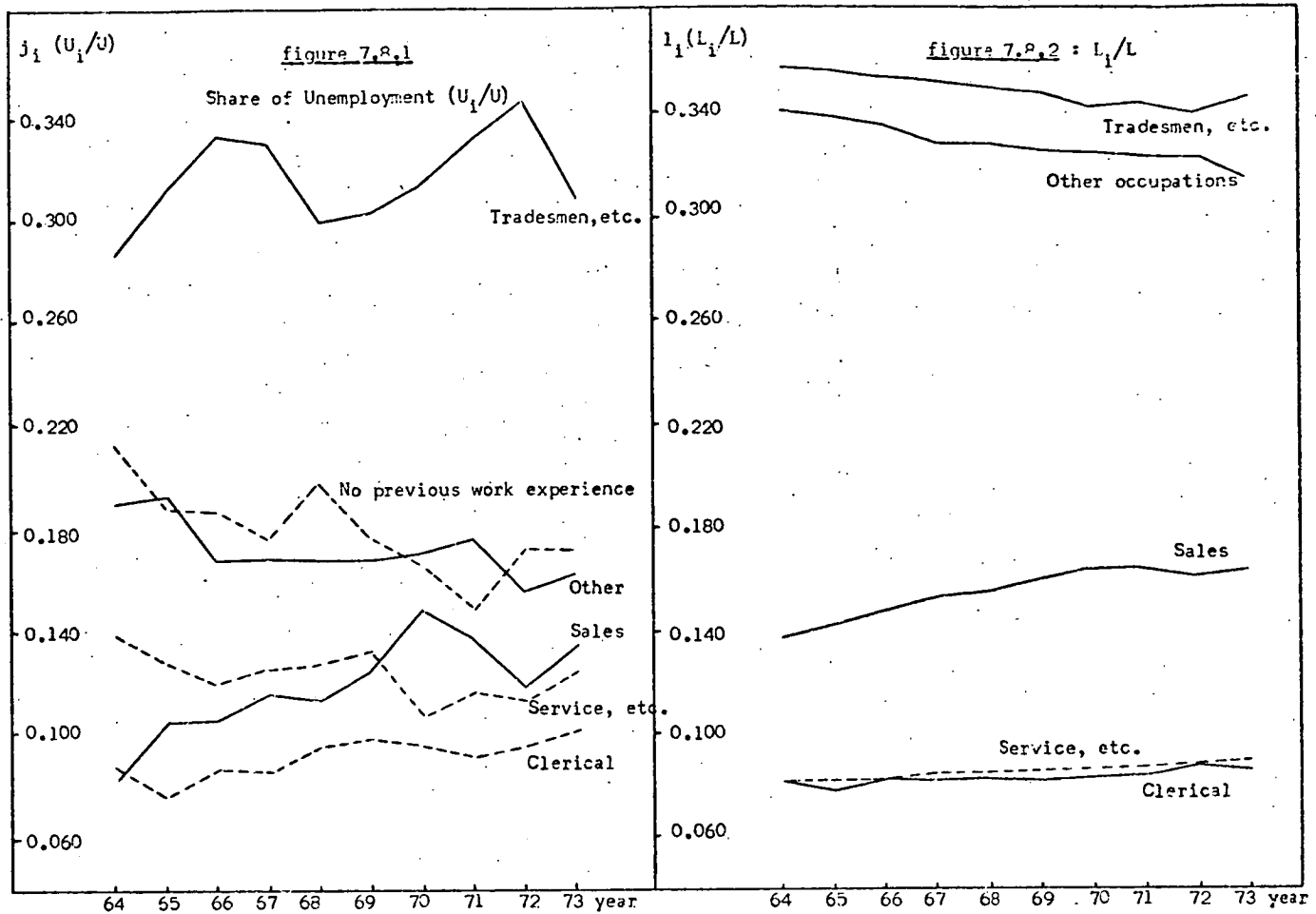
	1964		1969		1973	
	j_i	k_i	j_i	k_i	j_i	k_i
opc	0.305	0.216	0.306	0.287	0.324	0.232
obc	0.020	0.049	0.028	0.037	0.027	0.034
ome	0.033	0.212	0.053	0.137	0.052	0.121
oos	0.278	0.315	0.264	0.355	0.231	0.389
oum	0.155	0.086	0.167	0.065	0.204	0.090
oso	0.181	0.088	0.141	0.091	0.128	0.103
oru	0.038	0.036	0.040	0.027	0.034	0.030

7.8 Occupations : Structure of Unemployment

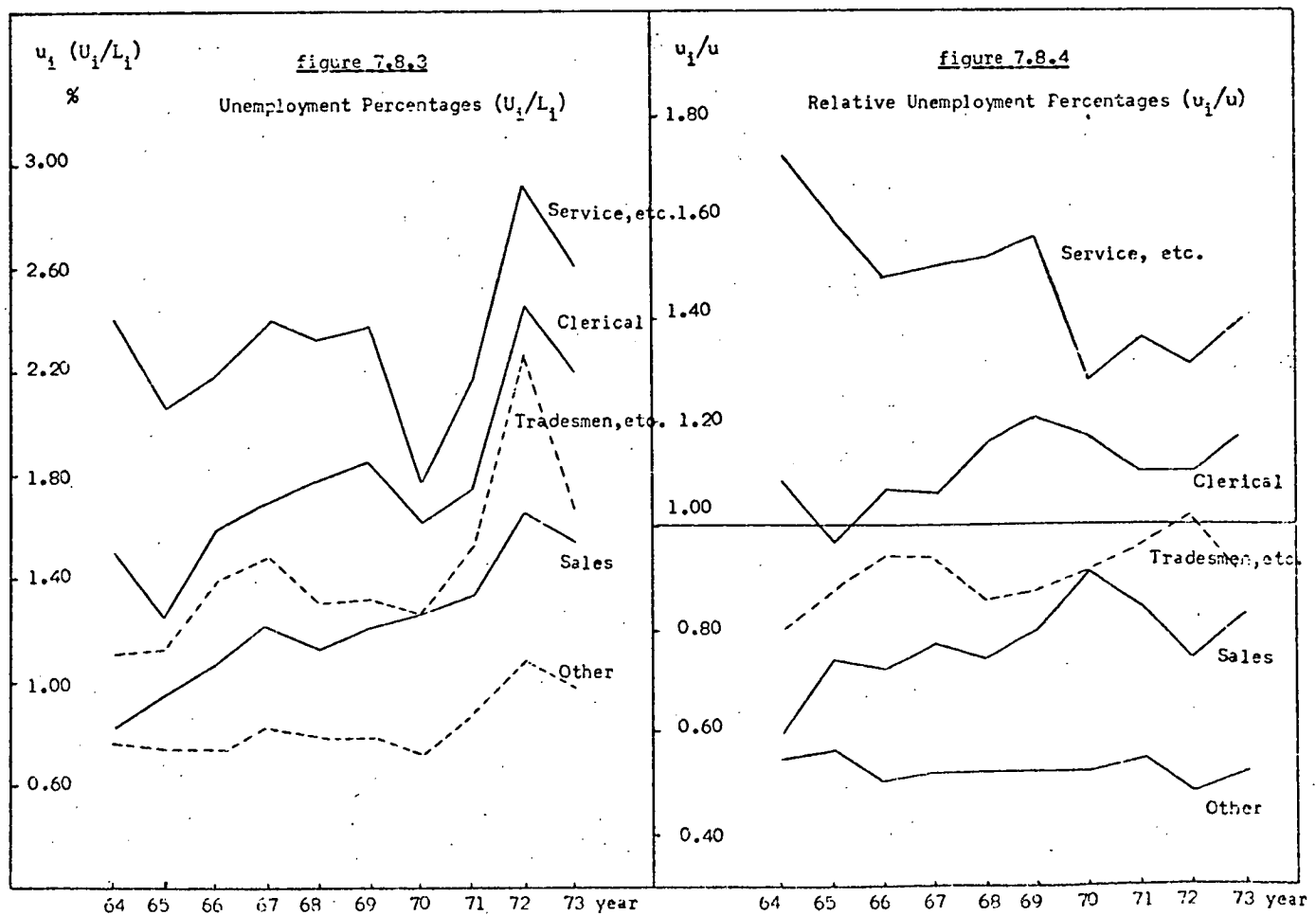
This section presents an analysis of the structure of unemployment for occupational sectors based on Labour Force Survey data.

Figure 7.8.1 presents sectoral shares of unemployment for the period 1964-73. The shares of the clerical and sales sectors in unemployment

OCCUPATIONS : SHARE OF UNEMPLOYMENT AND THE LABOUR FORCE



OCCUPATIONAL UNEMPLOYMENT PERCENTAGES



increased in the period under observation; the share of tradesmen, production process workers, etc. in unemployment fluctuated, but also exhibited an increase overall between 1964 and 1973. These increases were offset by decreases in the shares of unemployment for service, sport and recreation, other occupations and those with no previous work experience.

Data on each occupation as a proportion of the total labour force (L_i/L) are presented in figure 7.8.2. There were decreases in the relative importance of tradesmen, etc. and other occupations in the labour force and these decreases were offset by a large increase in the relative importance of the sales sector and small increases for clerical and service, sport and recreation.

Figures 7.8.3 and 7.8.4 present graphs of the sectoral unemployment percentages for occupations and unemployment percentages expressed as a ratio of the aggregate unemployment percentage. The most noticeable trends in figure 7.8.3 are the stability of the unemployment percentage for other occupations, the increase over time in the unemployment percentage for sales occupations and the sensitivity of the unemployment percentages for the other three sectors to changes in the demand for labour. Overall there is no apparent change in the dispersion of sectoral unemployment percentages. In figure 7.8.4 it is evident that the relative unemployment percentage for service, sport and recreation decreased in the period 1964-73, while the relative unemployment percentages for other occupational sectors (except "other occupations") increased.

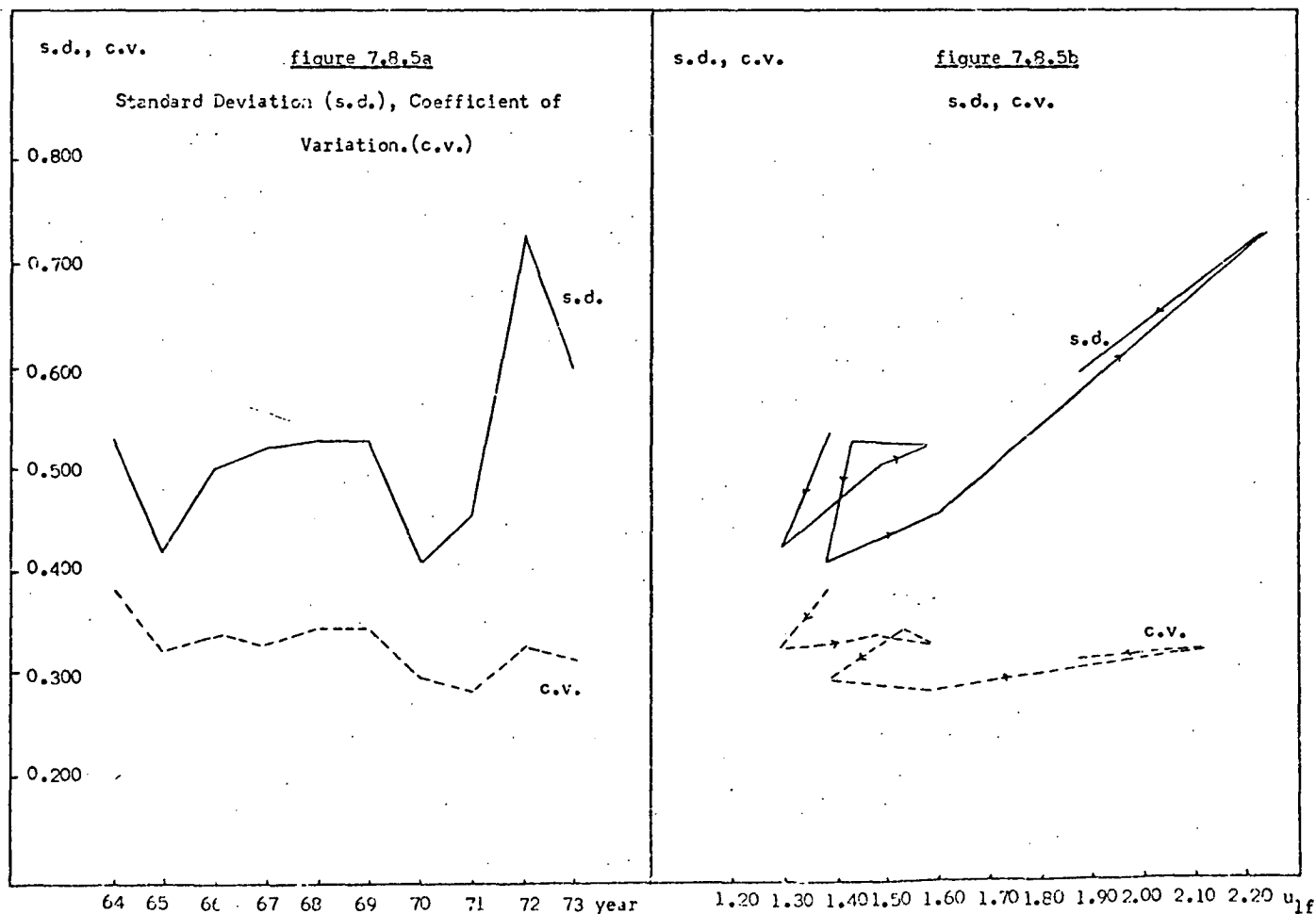
Table 7.8.1 presents a summary analysis of changes in the structure of unemployment by occupation. Between both 1964 and 1969 and 1969 and 1973 the share of unemployment (j_i) for sales occupations increased with increases in both l_i and u_i/u , changes in u_i/u

Table 7.8.1

Changes in the Structure of Occupational Unemployment.

SECTOR	1964			1969			Changes in j_i due to			1973			Changes in j_i due to		
	u_i/u	l_i	j_i	u_i/u	l_i	j_i	l_i	u_i/u		u_i/u	l_i	j_i	l_i	u_i/u	
Sales	0.60	0.137	0.082	0.79	0.159	0.125	0.017	0.026		0.83	0.162	0.134	0.002	0.007	
Clerical	1.09	0.081	0.088	1.21	0.081	0.098	0.000	0.010		1.18	0.086	0.101	0.005	-0.002	
Tradesmen, Production Workers	0.80	0.358	0.286	0.87	0.348	0.302	-0.009	0.025		0.89	0.346	0.307	-0.003	0.008	
Service, Sport and Recreation	1.73	0.081	0.139	1.56	0.085	0.132	0.006	-0.013		1.40	0.089	0.124	0.005	-0.013	
Other Occupations	0.55	0.341	0.190	0.52	0.325	0.168	-0.009	-0.013		0.52	0.314	0.162	-0.007	0.001	

OCCUPATIONS : MEASURES OF DISPERSION OF UNEMPLOYMENT PERCENTAGES



having a greater impact than changes in l_i . Between 1964 and 1969 the j_i for clerical occupations increased as a result of an increase in u_i/u ; between 1969 and 1973 an increase in l_i was partially offset by a decrease in u_i/u . The l_i for tradesmen, etc. decreased throughout the period, but this trend was more than offset by an increase in u_i/u resulting in an increase in j_i from 0.286 in 1964 to 0.307 in 1973. Although the l_i for service, sport and recreation increased, the sector's share of unemployment decreases as a result of decreases in u_i/u . There was a decrease in j_i for other occupations between 1964 and 1973 with decreases in both l_i and u_i/u .

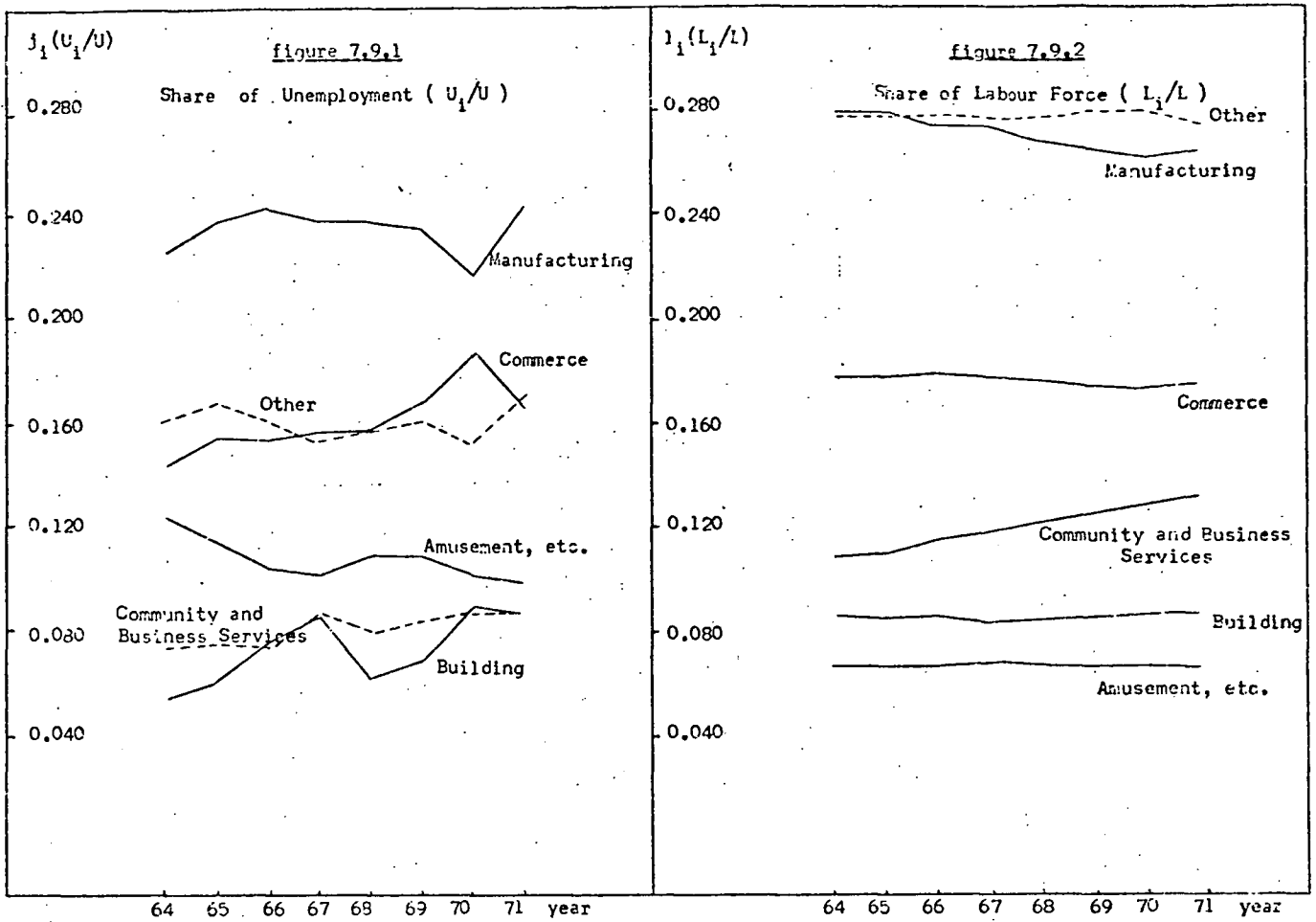
Figures 7.8.5a & b graphically present measures of dispersion for occupational unemployment percentages. The standard deviation, s.d., varies cyclically in accord with the unemployment percentage. The coefficient of variation, c.v., does not vary greatly in response to changes in the unemployment percentage and decreased in the period 1964-73. This is apparent in figure 7.8.5b in which the c.v. decreased as against the unemployment percentage in the period 1964-71 and then increased slightly.

The results generally indicate that there was a decrease in the dispersion of sectoral unemployment percentages for occupations up to 1971 and this would have contributed to the decrease in non demand-deficient unemployment observed in 1967. There is no evidence to suggest that changes in the occupational structure of unemployment contributed to the increase in non demand-deficient unemployment in 1972.

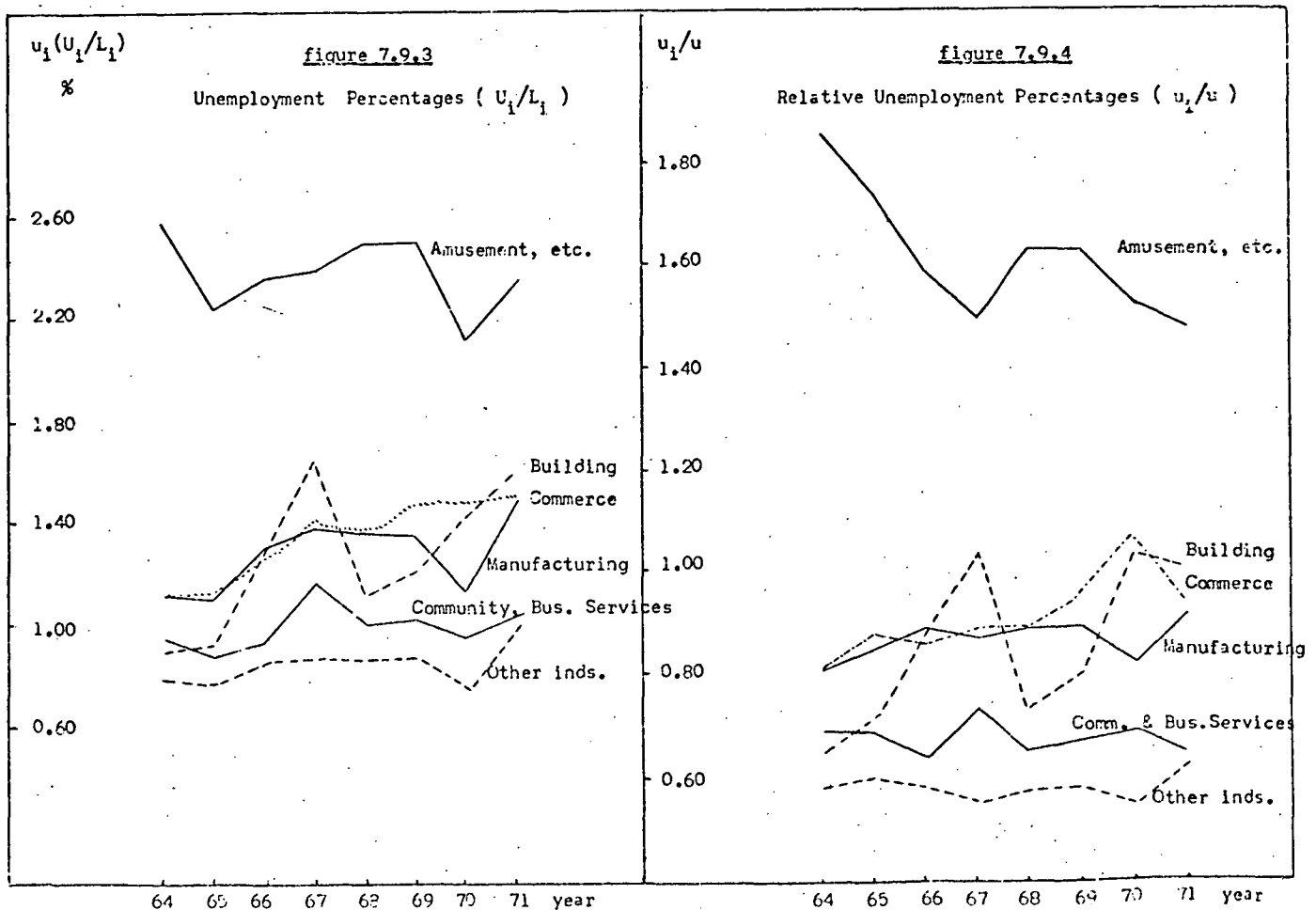
7.9 Industries : Structure of Unemployment

This section contains an analysis of Labour Force Survey data on unemployment by industry for the period 1964-71. A change in the

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classification of industries introduced in 1972 makes data for 1972 and 1973 non-comparable with those for earlier periods. A brief analysis of data on unfilled vacancies by industry is also presented.

Figure 7.9.1 presents the share of each industrial sector in total unemployment (j_i). The j_i for manufacturing increased to 1966, decreased in the period 1967-70 and then increased to just above the level for 1966 in 1971. The share of unemployment for building and construction, commerce and community and business services increased, while that for amusement, hotels and personal service decreased, in the period 1964-71.

Figure 7.9.2 presents graphs of the relative importance of each sector in the labour force (l_i). With respect to four sectors (building and construction, commerce, amusement, etc. and "other") there is no marked variation in l_i in the period 1964-71. An increase in l_i for community and business services is offset by a decline in l_i for manufacturing industry.

Sectoral unemployment percentages and these unemployment percentages relative to the aggregate unemployment percentage are presented graphically in figures 7.9.3 and 7.9.4. Figure 7.9.3 indicates that the unemployment percentages for amusement, etc., building and construction and manufacturing are the most sensitive to changes in the demand for labour. With respect to figure 7.9.4, there are increases in the relative unemployment percentages for building and construction and commerce, offset by a decrease for amusement, etc.

Changes in the period 1964 to 1971 are summarised in table 7.9.1. Although the l_i for manufacturing decreases, this change is more than offset by increases in the relative unemployment percentage and j_i increases. The share of unemployment, j_i , for building and construction and commerce also increased as a result of increases in the

Table 7.9.1

Changes in the Structure of Industrial Unemployment.

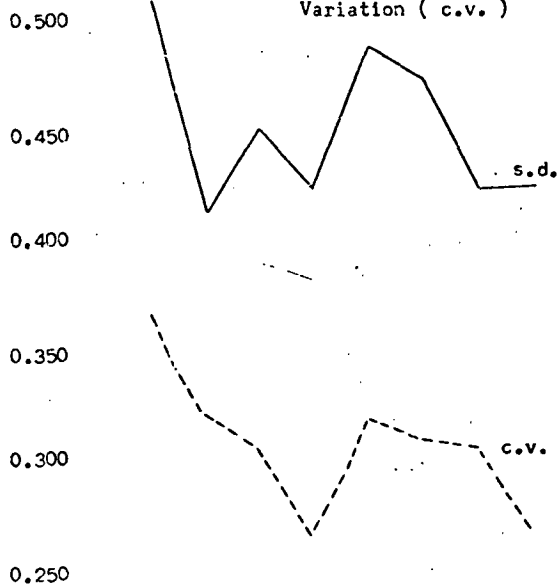
SECTOR	1964			1969			Changes in j_i due to		1973			Changes in j_i due to	
	u_i/u	l_i	j_i	u_i/u	l_i	j_i	l_i	u_i/u	u_i/u	l_i	j_i	l_i	u_i/u
Manufacturing	0.81	0.280	0.226	0.89	0.265	0.235	-0.014	0.023	0.92	0.265	0.244	0.000	0.009
Building and Construction	0.65	0.086	0.055	0.80	0.086	0.069	0.000	0.014	1.01	0.086	0.087	0.000	0.018
Commerce	0.81	0.178	0.144	0.96	0.174	0.168	-0.003	0.027	0.94	0.176	0.167	0.003	-0.004
Community and Business Services	0.69	0.108	0.074	0.67	0.126	0.084	0.012	-0.002	0.65	0.133	0.087	0.005	-0.002
Amusement, Hotels and Personal Service	1.86	0.067	0.125	1.63	0.067	0.109	0.000	-0.016	1.48	0.066	0.092	-0.001	-0.010
Other Industries	0.58	0.279	0.161	0.58	0.280	0.161	-0.001	0.001	0.62	0.274	0.169	-0.005	0.013

INDUSTRIES : MEASURES OF DISPERSION OF UNEMPLOYMENT PERCENTAGES

s.d., c.v.

figure 7.9.5a

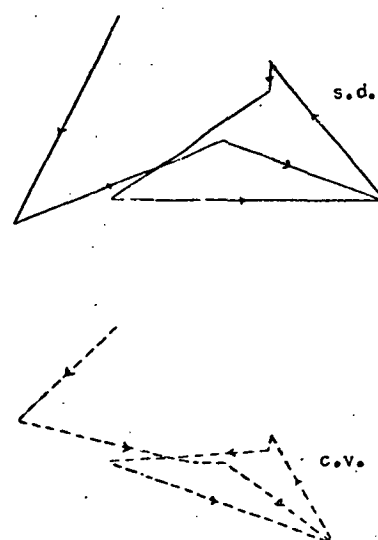
Standard Deviation (s.d.), Coefficient of Variation (c.v.)



s.d., c.v.

figure 7.9.5b

s.d., c.v.



64 65 66 67 68 69 70 71 year

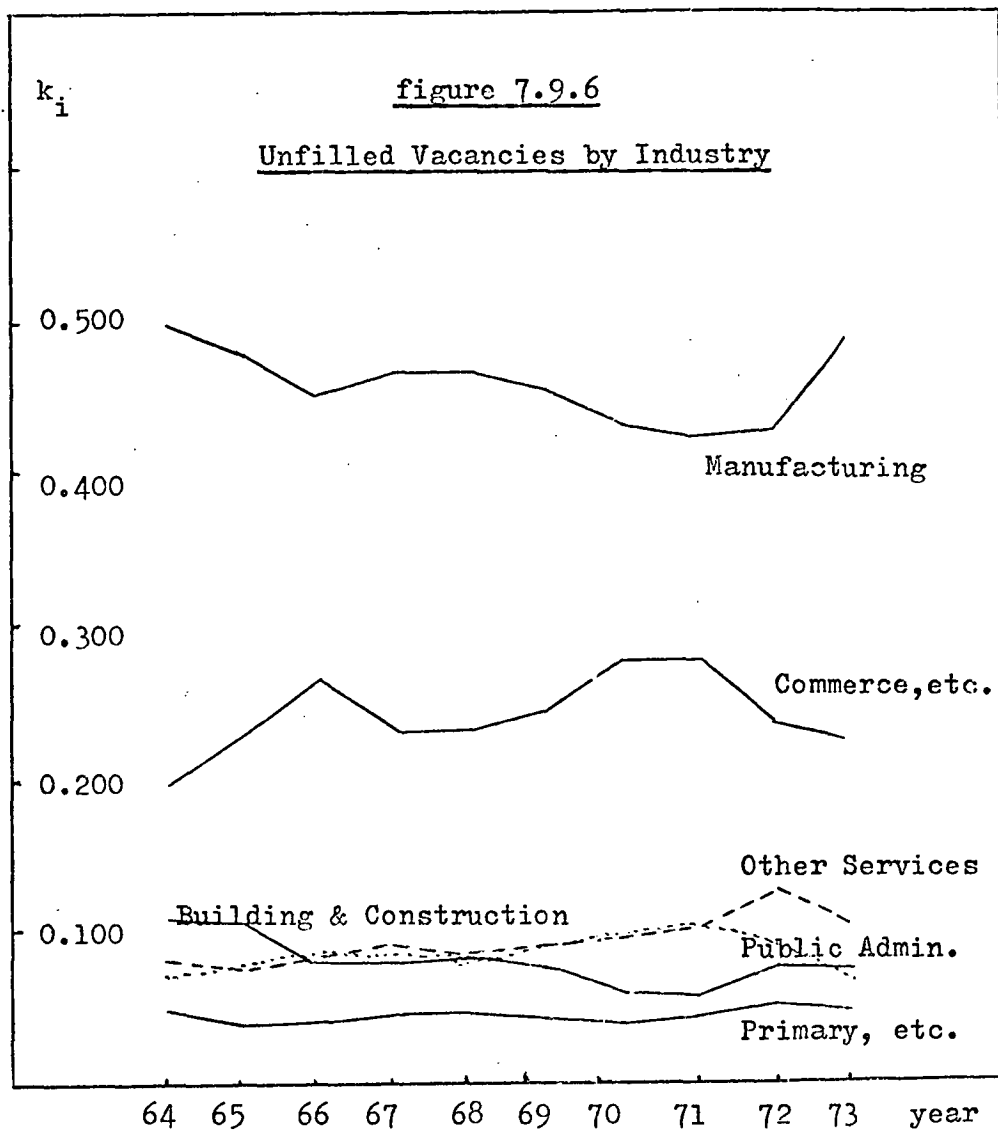
1.20 1.30 1.40 1.50 1.60 u_{lf}

relative unemployment percentages. The l_i for community and business services increased from 0.108 in 1964 to 0.133 in 1971 and, although u_i/u decreased slightly, j_i for the sector increased. The j_i for amusement, hotels and personal service decreased from 0.125 in 1964 to 0.098 in 1971 almost entirely as a result of a decrease in u_i/u . An increase in u_i/u resulted in an increase in j_i for "other industries".

Figures 7.9.5a & b graphically present measures of dispersion of unemployment percentages for industrial sectors. The standard deviation fluctuated considerably in the 1964-71 period and not all of this variation was related to movements in the unemployment percentage, as evident in figure 7.9.5b. The coefficient of variation exhibited a downward trend in the period and this is apparent in both figure 7.9.5a and in figure 7.9.5b, in which the coefficient of variation is plotted against the aggregate unemployment percentage. This trend towards an improved distribution of unemployment in the labour force would have contributed to the decrease in non demand-deficient unemployment observed to have taken place in 1967; there is no evidence of a similar contribution to the increase in aggregate non demand-deficient unemployment in 1972.

Figure 7.9.6 graphically presents C.E.S. data on the share of total unfilled vacancies for each industrial sector (the industrial classification differs from that for the Labour Force Survey). The general conclusion from figure 7.9.6 is that there have not been marked changes in the industrial structure of unfilled vacancies. The manufacturing share of unfilled vacancies decreased to 1971, but then increased in 1972 and 1973. The share of commerce in unfilled vacancies generally increased in the period. One aspect of significance is that the share of unfilled vacancies decreased for all sectors

except manufacturing in 1973. That is, there may have been a more than proportionate increase in non demand-deficient for the manufacturing sector in 1972-73.



CHAPTER 8

SUMMARY AND CONCLUSIONS

8.1 Introduction.

As stated in chapter one, the objective of this thesis is to analyse the nature of unemployment in the Australian labour market, particularly the unemployment which persists even when the economy is at or near full employment. After reviewing the literature relating to the study of unemployment it was decided to base the analysis largely on the unemployment-vacancy relationship and the use thereof in estimating the level of non demand-deficient unemployment. The analytical framework for the study is outlined in chapter three while data requirements and availability are considered in chapter four.

The aggregate unemployment-vacancy relationship is estimated in chapter five and tested for stability. It was observed that two changes in the position of the relationship occurred in the period 1964-73, reflecting firstly a decrease and subsequently an increase in the level of non demand-deficient unemployment. The nature and causes of the changes in the aggregate unemployment-vacancy relation were studied in chapter six and a summary of the findings is presented in section 8.2. The analysis of non demand-deficient unemployment and changes therein is developed further by means of a study of sectors of the labour force. This study is contained in chapter seven and a summary of the findings is presented in section 8.3.

The study does not purport to define specific policies for reducing unemployment, but to provide an analytical and empirical framework for the evaluation of policies. The findings do have

some implications for both demand manipulation and manpower policies and these are considered in section 8.4. Section 8.5 outlines areas requiring additional research and development and section 8.6 presents an overall conclusion from the results of the analysis of unemployment.

8.2 Summary of Findings : Aggregate Labour Market.

The starting point of the analysis is the graphical presentation of time series on unemployment and unfilled vacancies and this shows consistent inverse parallelism between the two series. The portrayal of these data on an unemployment-vacancy graph suggested that changes in the unemployment-vacancy relationship, and thus in the level of non demand-deficient unemployment, occurred in the 1964-73 period. The testing of the aggregate unemployment-vacancy relationship confirmed that a movement of the relationship towards the origin took place in 1967 associated with a small decrease in non demand-deficient unemployment and in 1972 the relationship moved outwards with an associated larger increase in non demand-deficient unemployment. The log-linear form performed better than the linear equations and is a more reliable indicator of the nature of changes in the relationship. The preferred equations for both C.E.S. and L.F.S. unemployment are presented below :

$$\begin{aligned} \bar{u}_r &= 0.130 - 1.034\bar{v} - 0.142D_1 + 0.025D_2\bar{v} + 0.498D_3 + 0.685D_4\bar{v} \quad (\bar{R}^2 = 0.965) \\ &\quad (12.748)(13.787) \quad (7.346)^2 \quad (0.255)^2 \quad (21.784)^4 \quad (9.337)^4 \quad (D.W.S.=1.950) \\ \bar{u}_{lf} &= 0.329 - 0.562\bar{v} - 0.108D_1 - 0.021D_2\bar{v} + 0.304D_3 + 0.095D_4\bar{v} + 0.004t' \\ &\quad (16.269) \quad (4.767) \quad (2.559)^2 \quad (0.150)^2 \quad (6.642)^5 \quad (0.857)^5 \quad (2.018) \\ &\quad (\bar{R}^2=0.883; D.W.S.=1.423) \end{aligned}$$

Having determined the timing of the changes in non demand-deficient unemployment, unemployment-vacancy relationships were estimated for sub-periods. These sub-period relationships were combined with estimates of the statement ratio in unfilled vacancies to determine the level of non demand-deficient unemployment. The derived

estimates of non demand-deficient unemployment for each sub-period are shown below :

<u>Period</u>	u_r (%)	u_{lf} (%)
$64_m - 67_j$	1.25	1.40
$67_s - 72_m$	1.16	1.36
$72_j - 73_d$	1.54	1.71

These changes in non demand-deficient unemployment mean that the unemployment series would overstate the demand for labour in the period 1967_s to 1972_m and would understate the demand for labour after 1972_m as compared with the period 1964_m to 1967_j . That is, changes in non demand-deficient unemployment bias the unemployment series as a consistent measure of the demand for labour.

The nature of the changes in non demand-deficient unemployment were investigated by means of an analysis of the behaviour of the incidence and duration of unemployment and unfilled vacancies. The incidence of C.E.S. unemployment became more sensitive to the unemployment percentage and increased in the period 1964-73 while the average duration of C.E.S. unemployment became less sensitive to the unemployment percentage as from 1967 and decreased through time. This increase in the incidence of C.E.S. unemployment, the flow of persons registering for employment, would result in an increase in non demand-deficient unemployment in the labour market.

Similar changes are apparent with respect to L.F.S. unemployment with a secular increase in incidence, and decrease in average duration, of L.F.S. unemployment. In the period 1964-73 there was a decrease in the proportion of long-term unemployment (thirteen weeks or more) in total unemployment and, thus, increases in shorter term unemployment.

The behaviour of the unfilled vacancies series in the period

1964-73 reflects an increase in the incidence of unfilled vacancies through time (i.e. an increase in the flow of new vacancies notified to the C.E.S.) and a decrease in the average duration of unfilled vacancies as from 1967.

The changes in the behaviour of the incidence and duration of unemployment and unfilled vacancies suggest an increase in labour turnover in the period 1964-73 : assuming the proportion of persons in the turnover flow who experience unemployment remains the same, an increase in the incidence of unemployment reflects an increase in turnover in the labour force.

The data available on turnover in the Australian labour market are generally inadequate, but it is possible to make the following general observations for the period 1964-73. Firstly, the Australian labour market is characterised by a high level of labour turnover and in the period under consideration labour turnover increased, as evident in the behaviour of the separation rate for both males and females. Secondly, the quit rate for adult males was relatively low in the period 1967-71 and this would have been a reason for the inwards movement of the aggregate unemployment-vacancy relationship as from 1967; a high quit rate for males in 1973, particularly in relation to the level of unemployment, would have partially caused the increase in non demand-deficient unemployment in the latter part of the period. Thirdly, the quit rate for females generally increased throughout the period and this accounts for increases in non demand-deficient unemployment for adult females in both 1967 and 1972.

Surveys of labour force experience undertaken by the Australian Bureau of Statistics in 1968 and 1972 demonstrate that those persons in the labour force experiencing multiple spells of unemployment and

long durations of unemployment contribute disproportionately to total unemployment. Even in 1972, a period of relatively high unemployment, only ten per cent of the total labour force experienced unemployment. Data on labour mobility shows that a large majority of the labour force are in stable employment and in any particular year do not enter the turnover flow in the labour market. In general it can be concluded that a small proportion of the labour force account for a large share of labour turnover and the flow of unemployed persons.

The results for the supply and demand variables tested are poor and it is difficult to draw firm conclusions. There is evidence of a decrease in population growth in 1972-73, offset by an increase in the participation rate; no significant change in the behaviour of labour productivity is apparent. Supply and demand factors do not appear to have been significant causes of the changes in non demand-deficient unemployment in the 1964-73 period.

8.3 Summary of Findings : Sectors of the Labour Force

8.3.1 Age-Sex Sectors

In 1967 there was a movement of the unemployment-vacancy relationship for adult females associated with an increase in non demand-deficient unemployment for the sector. There were movements towards balance in the other three sectors considered (adult males, junior males, junior females) with the effect of reducing aggregate non demand-deficient unemployment between 1964 and 1969, thus offsetting the increase in non demand-deficient unemployment for adult females.

As from 1972 there were increases in non demand-deficient unemployment for adult males, adult females and junior females and these increases were compounded by a movement away from balance for each of

the four age-sex sectors between 1969 and 1973. The increase in aggregate non demand-deficient unemployment in 1972 resulted from the combined effect of increases in non demand-deficient unemployment for adult males and females and junior females and the redistribution of demand between sectors which acted to restore imbalances in the labour market, after a general movement towards balance between 1964 and 1967. In 1973, the high level of demand-deficient unemployment for junior males and females is reflected in the fact that these sectors accounted for 43 per cent of unemployment, but only 25 per cent of unfilled vacancies.

The above trends are reflected in Labour Force Survey data which show an increase in the relative unemployment percentage for junior males and a continuing high relative unemployment percentage for junior females (15-19 years of age). The dispersion of age-sex unemployment percentages initially decreased in the period 1964-73 and then increased in 1972 and 1973.

The increasing participation of adult women in the labour force, together with increases in non demand-deficient unemployment for adult females in both 1967 and 1972, has significantly contributed to the increase in aggregate non demand-deficient unemployment. Adult males contributed to the increase in non demand-deficient unemployment in 1972, probably as a result of increased labour turnover. The relative importance of juniors in the labour force decreased and this trend would tend to reduce aggregate non demand-deficient unemployment, but this change was offset by^a continuing, and in the case of males increasing, shortage of jobs for young people.

8.3.2 Regions The only significant changes in 1967 reflected increases in non demand-deficient unemployment for Queensland and

Western Australia, opposite trends to that for the aggregate labour market. In 1972 there were increases in non demand-deficient unemployment for non-metropolitan N.S.W., Melbourne, non-metropolitan Victoria and South Australia and a decrease in non demand-deficient for Western Australia. There were movements both towards and away from balance for regions with no significant overall impact on the aggregate level of non demand-deficient unemployment. The imbalance in the distribution of demand between regions is reflected in the fact that in 1973 one-third of unemployment and two-thirds of unfilled vacancies related to Sydney, Melbourne and Brisbane. There was a general convergence of State unemployment percentages (with the exception of Tasmania) in the period 1964-73, a trend which would have contributed to the reduction in non demand-deficient unemployment in 1967 and would have offset the increase therein in 1972.

8.3.3 Occupations and Industries In 1967 there was a decrease in non demand-deficient unemployment for unskilled manual workers, but this was offset by increases for skilled metal and electrical and skilled building and construction workers. In 1972 there were increases in non demand-deficient unemployment for unskilled manual, other skilled and service occupations. In the period 1964-73 there was a movement towards balance for skilled building and construction, skilled metal and electrical and service occupations and movement away from balance for other skilled and unskilled manual. There was a small decrease in the dispersion of occupational unemployment percentages and this factor would have contributed to the decrease in non demand-deficient unemployment observed in 1967.

The analysis of industrial sectors was more restricted than that for age-sex sectors, regions and occupations. There was some decrease in the dispersion of industrial unemployment percentages.

8.4 Policy Implications.

This section presents brief comments on the policy implications that follow from the findings of the study. The comments relate to both demand manipulation and manpower policies.

The analysis has clearly established that significant changes in the level of non demand-deficient unemployment took place in the period 1964-73 and it is reasonable to expect that further changes will occur. This means that in the formulation of the objectives of demand policies greater recourse should be given to the unemployment-vacancy relationship and the associated level of non demand-deficient unemployment. The achievement of zero demand-deficient unemployment will not necessarily be the goal of economic policy, since at that point there will be excess demand in certain sectors as a result of imbalance in the labour market. The level of non demand-deficient unemployment will provide a guide as to the aggregate unemployment percentage that can be attained without causing overall excess demand in the labour market. It is significant that the behaviour of the unemployment-vacancy relationship reflects the changed level of non demand-deficient unemployment before the labour market experiences a period of high demand for labour. This means that, even allowing for reporting lags, the statistics on unemployment and unfilled vacancies should provide early indications of changed circumstances.

In the definition of specific goals for the operation of manpower policy it should be realised that balance in the labour market will not normally be represented by equality in unemployment percentages for sectors. Factors that cause unemployment, such as labour turnover, vary between sectors and this is reflected in differing levels of non demand-deficient unemployment.

An important conclusion to emerge from the analysis is that changes in non demand-deficient unemployment appear to be closely related to the behaviour of labour turnover. The Australian labour market is characterised by a high level of labour turnover and, although the dynamic nature of the labour market requires some movement between jobs and labour force status, there is scope for the implementation of policies to reduce the impact of turnover in the labour force on unemployment and unfilled vacancies. In studying the impact of labour turnover two important series are the flows of persons onto the unemployment register and of new vacancies.

One means of reducing non demand-deficient unemployment is to identify and provide stable employment for those persons in the labour force who experience either long periods of unemployment or recurring unemployment. While the cost of programs to achieve this objective would be high, the impact of these persons on total unemployment is considerable even though they represent a very small proportion of the labour force.

Demographic factors such as the participation of married women in the labour force and the educational habits of young people have a marked impact on the level of non demand-deficient unemployment and manpower policies need to adapt to changes in the behaviour of age-sex groups. The main problem relating to age-sex groups to emerge from the analysis is the need for jobs for young people. Although labour turnover is high for juniors, this would not appear to be the main reason for high unemployment in the junior male and female sectors. The current (1976-77) problems with respect to youth unemployment are an extension of a trend clearly established in the 1964-73 period.

There is imbalance in the regional distribution of the demand for labour and there is scope for reducing non demand-deficient

unemployment through policy initiatives designed to redistribute the demand for labour away from Sydney, Brisbane and Melbourne. Similarly there is an uneven distribution of unemployment and unfilled vacancies between occupations - 51 per cent of unfilled vacancies and only 28 per cent of unemployment related to the other skilled and skilled metal and electrical sectors in 1973. Vacancy data for these sectors could be used as a partial guide in the implementation of retraining policies.

In Australia there is a need for the clarification of the objectives of policies relating to unemployment, including the breakdown of the overall unemployment goal into objectives for sectors of the labour force. Current policies lack integration into an overall manpower policy for Australia which would attempt to alleviate existing problems and facilitate adaptation of the labour market to changes in circumstances. There is considerable scope for reductions in the level of non demand-deficient unemployment in the Australian labour market through the implementation of appropriate manpower policies. The most suitable timing for the implementation of such policies is in the expansionary phase of the cycle of economic activity as the labour market approaches full employment.

8.5 Suggestions for Further Work

The study of unemployment presented in this thesis has been undertaken within an analytical framework. One important area requiring further research is the integration of relationships in the labour market into a comprehensive model, with a mathematical rather than simply an analytical framework. There are two aspects in particular that deserve attention : firstly, the relationship between labour turnover and unemployment and unfilled vacancies and,

secondly, the summation of sectoral unemployment-vacancy relationships to obtain the aggregate relationship.

The usefulness of the study is constrained by two data limitations : incomparability between C.E.S. and L.F.S. sectoral classifications and the lack of comprehensive quarterly data on labour turnover. The overcoming of the first limitation would facilitate the comparison of levels of non demand-deficient unemployment between sectors while improved data on labour turnover would be invaluable in the assessment of the impact of flows in the labour market on the levels of unemployment and unfilled vacancies. It would also be useful to obtain data on the previous labour force status (e.g. employed, not in the labour force) of the unemployed and the reason for their current unemployment (e.g. quit previous job, transition from housewife to employment).

The estimated unemployment-vacancy relationships for some key sectors of the Australian labour market (e.g. Sydney metropolitan area) did not perform fully satisfactorily and further analysis of the nature and behaviour of unemployment and unfilled vacancies for these sectors is desirable.

8.6 Conclusion

The reduction of unemployment in the Australian labour market requires a combination of demand management and manpower policies. It is significant that the observed reduction in non demand-deficient unemployment in 1967 occurred at a time in which the economy experienced an extended period of stable full employment. The achievement and maintenance of full employment through demand manipulation is an essential prerequisite for the effective implementation of an integrated manpower policy aimed at reducing non demand-deficient unemployment.

BIBLIOGRAPHY

1. BOOKS

- Beveridge, W.H. Full Employment in a Free Society, London : Allen and Unwin, 1944.
- Dept. of Labour, An Analysis of Full Employment in Australia, Labour Market Studies No. 2, Victoria : Dominion Press, 1970.
- _____, Manpower Policy in Australia, (A Report to the O.E. C.D.) Australian Government Publishing Service, 1974.
- Fowler, R. Duration of Unemployment on the Register of Wholly Unemployed, London : H.M.S.O. 1968.
- Gordon, R.A. The Goal of Full Employment, John Wiley, 1967 .
- Gordon, R.A.&M.S.(eds.) Prosperity and Unemployment John Wiley, 1966 .
- Gordon, R.A. (ed.) Towards a Manpower Policy, John Wiley, 1967 .
- Isaac, J.E. & Ford, G.W., Australian Labour Economics Readings, Sun Books, 1967.
- Jakubauskas, E.B. & Palomba, N.A., Manpower Economics, Addison-Wesley Publishing Company, 1973 .
- Johnston, J. Econometric Methods, New York, McGraw Hill, 1960.
- Knowles, J.W.& Kalachek, E.D., Higher Unemployment Rates, 1957-60; Structural Transformation or Inadequate Demand, Joint Economic Committee, Washington, 1961.
- MacKay, D.I. et al. Labour Markets Under Different Employment Conditions, London : Allen and Unwin, 1971.
- Myers, J.C. & Creamer, D. Measuring Job Vacancies, Conference Board, Studies in Business Economics, No. 97.
- National Bureau of Economic Research, The Measurement and Behaviour of Unemployment, Princeton University Press, 1957.
- National Bureau of Economic Research, The Measurement and Interpretation of Job Vacancies, Columbia Uni.Press, 1966.
- Perlman, R. Labor Theory, John Wiley, 1969..
- Phelps, E.S. et al, The New Microeconomics in Employment and Inflation Theory, New York, Norton : 1970.

- Pigou, A. Unemployment London : William and Norgate, 1913.
- President's Committee to Appraise Employment and Unemployment Statistics, Measuring Employment and Unemployment , Washington, 1962.
- Ross, A.M.(ed.) Employment Policy and the Labour Market, University Of California Press, 1965.
- Ross, A.M.(ed.) Unemployment and the American Economy, John Wiley, 1964.
- Stieber, J.(ed.) Employment Problems of Automation and Advanced Technology, England : Macmillan, 1966.
- Subcommittee on Economic Statistics, Report on Job Vacancy Statistics, U.S. Government Printing Office, Washington, 1966.
2. Journal Articles, Papers, etc.
- Archibald, G.C. "Regional Multiplier Effects in the United Kingdom" Oxford Economic Papers, 19, 1967, pp. 22-45.
- _____, "The Phillips Curve and the Distribution of Unemployment", American Economic Review, May 1969, Papers and Proceedings, pp. 124-134.
- Armknacht, P.A. & Early, J.F. "Quits in Manufacturing : A Study of Their Causes", Monthly Labor Review, Nov.'72, pp.31-37.
- Bermann, B.R. & Kaun, D.E. Structural Unemployment in the United States, U.S. Govt. Printing Office : Washington, 1967.
- Borus, M.E. "Has Structural Unemployment Worsened?" Industrial Relations, 4, February 1965, pp. 111-114.
- Bowers, J. et al, "The Change in the Relationship Between Unemployment and Earnings Increases : A Review of Some Possible Explanations", National Institute Economic Review, no. 54, November 1970, pp. 44-62.
- Bowers, J. et al, "Some Aspects of Unemployment and the Labour Market, 1966-71", National Institute Economic Review, no. 62, November 1972, pp. 75-88.
- Bowers, J. "Unemployment Statistics 1966-70 : A Note", British Journal of Industrial Relations, July 1973, pp.286-90.

- Brechling, F. "Trends and Cycles in British Regional Unemployment", Oxford Economic Papers, 19, March 1967, pp. 1-21.
- Chow, G.C. "Tests of Equality Between Sets of Coefficients in Two Linear Regressions", Econometrica no. 28, July, 1960, pp. 591-605.
- Cohen, M.S. & Solow, R.M. "The Behaviour of Help-Wanted Advertizing", Review of Economics and Statistics, 49, February 1967 pp. 108-110.
- Corry, B.A. & Roberts, J.A. "Activity Rates and Unemployment : The Experience of the United Kingdom 1951-66", Applied Economics, 1979, volume 2, pp. 179-201.
- Cowling, K. & Metcalf, D. "Wage-Unemployment Relationships : A Regional Analysis for the U.K. 1960-65", Bulletin of the Oxford Institute of Economics and Statistics, 1967, pp. 31-39.
- Davies, G. "Regional Unemployment, Labour Availability and Redeployment", Oxford Economic Papers, 1967, pp.59-74.
- Dernburg, T.F. & Strand, K.T. "Hidden Unemployment 1953-62 : A Quantitative Analysis by Age and Sex", American Economic Review, 56, March 1966, pp. 71-95.
- Donner, A.W. & Lazer, F. "An Econometric Study of Segmented Labor Markets and the Structure of Unemployment : The Canadian Experience", International Economic Review, volume 14 no. 2, June 1973 pp. 312-327.
- Dow, J.C.R. "The Excess Demand for Labour : A Study of Conditions in Great Britain, 1946-56", Oxford Economic Papers, 10, February 1958, pp. 1-33.
- Flanagan, R.J. "The U.S. Phillips Curve and International Unemployment Rate Differentials", American Economic Review, vol.63, no. 1, March 1973, pp. 114-131.
- Foster, J.I. "The Behaviour of Unemployment and Unfilled Vacancies : G.B., 1958-71 - A Comment", Economic Journal, March 1973, pp. 192-203.
- Gallaway, L.E. & Dyckman, Z. "The Full Employment - Unemployment Rate : 1953-80", Journal of Human Resources, vol. 5, Fall 1970, pp. 487-510.

- Gallaway, L.E. "Labor Mobility, Resource Allocation and Structural Unemployment", American Economic Review, 53, Sept. 1963, pp. 694-716.
- Geary, R.C. & Hughes, J.C. "Certain Aspects of Non-Agricultural Unemployment in Ireland", Economics and Social Research Institute, Paper 52, February 1970.
- Gilroy, C.L. "Job Losers, Leavers and Entrants : Traits and Trends", Monthly Labor Review, August 1973, pp. 3-15.
- Gordon, R.A. "Unemployment Patterns With 'Full Employment'", Industrial Relations, vol. 8, October 1968, pp. 46-72.
- Gordon, R.J. "The Welfare Cost of Higher Unemployment", Brookings Papers on Economic Activity, No.1 1973, pp.133-205.
- Gujarati, D. "The Behaviour of Unemployment and Unfilled Vacancies", Economic Journal, March 1972, pp. 195-204.
- _____, "Relation Between the Help-Wanted Index and the Unemployment Rate, A Statistical Analysis, 1962-67", Quarterly Review of Economics, Winter 1968, pp.67-73.
- Gregory, R.G. & Sheehan, P.J. "The Cyclical Behaviour of the Australian Labour Market", paper read at the Third Conference of Economists, Adelaide, May 1973.
- Hagger, A.J. "The Excess Demand for Labour in Australia, 1948-63", Economic Record. 1970, pp. 26-54.
- Hall, R.E. "Prospects for Shifting the Phillips Curve Through Manpower Policy", Brookings Papers on Economic Activity, no. 3 1971, pp. 659-701.
- _____, "Turnover in the Labour Force", Brookings Papers on Economic Activity, no. 3 1972, pp. 709-756.
- _____, "Why Is the Unemployment Rate So High at Full Employment?", Brookings Papers on Economic Activity, no. 3 1970, pp. 369-410.
- Harris, C.P. & Thirlwall, A.P. "Interregional Variations in Cyclical Sensitivity to Unemployment", Bulletin of the Oxford University Institute of Economics and Statistics, volume 30, February 1968, pp. 55-66.

- Holmes, J.M. & Smyth, D.J. "The Relation Between Unemployment and Excess Demand for Labour : An Examination of the Theory of the Phillips Curve", Economica, August 1970, pp. 311-315.
- Holt, C.C. "Improving the Labour Market Tradeoff Between Inflation and Unemployment", Papers and Proceedings of the American Economic Association, May 1969, pp. 135-146.
- Holt, C.C. et al. "Manpower Proposals for Phase III", Brookings Papers on Economic Activity, no. 3 1971, pp. 703-722.
- Joseph, M.L. "Job Vacancy Measurement", Journal of Human Resources, Fall 1966, pp. 59-80.
- Kaitz, H.B. "Analyzing the Lengths of Spells of Unemployment", Monthly Labor Review, vol.93, November 1970, pp. 11-20.
- Kaliski, S.F. "Structural Unemployment in Canada : The Occupational Dimension", Carleton University Seminar Paper 68.01.
- Killingsworth, C.C. "Automation, Jobs and Manpower" in Bowen, W.G., Labor and the National Economy, (Norton : 1965).
- _____ "Full Employment and the New Economics", Scottish Journal of Political Economy, vol. 16, February 1969, pp. 1-19.
- Kleiman, E. "Measuring the Structural Severity of Unemployment", Industrial Relations, 7 , Feb. 1968, pp. 146-159.
- Konstant, R.A. & Wingeard, I.F.O. "Analysis and Use of Job Vacancy Statistics : Part I", Monthly Labor Review, August 1968, pp. 22-31.
- _____ "_____ : Part II", Monthly Labor Review, Sept. 1968, pp. 18-21.
- Lipsey, R.G. "The Relation Between Unemployment and Rate of Change of Money Wage Rates in U.K. 1862-1957 : A Further Analysis", Economica, v.27, February 1960, pp. 1-31.
- Llewellyn, D.T. & Newbold, P. "The Behaviour of Unemployment and Unfilled Vacancies", Industrial Relations Journal, Spring, vol. 4 no. 1, pp. 30-41.

- MacRae, C.D. et al. "Job Search, Labor Turnover, and the Phillips Curve : An International Comparison" in Proceedings of the Business and Economic Statistics Section, American Statistical Association, 1970, pp.560-564.
- Metcalf, D. and Richardson, R. "The Nature and Measurement of Unemployment in the U.K.", Three Banks Review, no. 93, March 1972, pp. 30-45.
- Neild, P.G. "The Construction and Estimation of a Coherent Labour-Market System", Australian Economic Papers, June 1973, pp. 106-123.
- Parsons, D.O. "Quit Rates Over Time : A Search and Information Approach", American Economic Review, volume 63 no.3, June 1973, pp. 390-401.
- Perry, G.L. "Changing Labour Markets and Inflation", Brookings Papers on Economic Activity, no. 3 1970, pp. 411-441.
- _____ "The Determinants of Wage Rate Changes and the Inflation-Unemployment Tradeoff for the U.S.", Review of Economic Studies, 31, October 1964, pp. 287-308.
- _____ "Unemployment Flows in the U.S. Labour Market", Brookings Papers on Economic Activity, no. 2, 1972, pp. 245-292.
- Pettman, B.O. "Some Factors Influencing Labour Turnover : A Review of Research Literature", Industrial Relations, Autumn vol. 4 no. 3, 1973, pp. 43-61 .
- Reder, M. "The Theory of Frictional Unemployment", Economica, February 1969, pp. 1-28.
- Stoikov, V. "Some Determinants of the Level of Frictional Unemployment : A Comparative Survey", International Labor Review, May 1966, pp. 530-549.
- _____ "Structural Unemployment - Comment", American Economic Review, 55, June 1965, pp. 527-531.
- Simler, N.J. "Long-term Unemployment, the Structural Hypothesis and Public Policy", American Economic Review, 54, Dec. 1964, pp. 985-1001.

- Solow, R. "The Nature and Sources of Unemployment in the U.S." in Wicksell Lectures, 1958-64, Almqvist & Wiksell, Stockholm, 1964.
- Steinke, J.C. "Problems in the Measurement of Unemployment", Journal of Industrial Relations, March 1969, pp. 39-53.
- Taylor, J. "The Behaviour of Unemployment and Unfilled Vacancies : Great Britain, 1958-71. An Alternative View", Economic Journal, December 1972, pp. 1352-1365.
- _____ "A Regional Analysis of Hidden Unemployment in Great Britain, 1951-66", Applied Economics, 1971, 3, pp. 291-303.
- Thirlwall, A.P. "Demand Disequilibrium in the Labour Market and Wage Rate Inflation in the U.K.", Yorkshire Bulletin, May 1969.
- _____ "The Recent 'Shift' in the U.S. Phillips Curve", Industrial Relations, October 1973, pp. 297 - 306.
- _____ "Regional Phillips Curves", Yorkshire Bulletin, vol. 32 no. 1, 1970, pp. 19-32.
- _____ "Regional Unemployment as a Cyclical Phenomenon", Scottish Journal of Political Economy, June 1966, pp. 205-219.
- _____ "Types of Unemployment : With Special Reference to 'Non Demand-Deficient Unemployment in Great Britain", Scottish Journal of Political Economy, Feb. 1969, pp. 20-49.
- Thomas, R.L. & Stoney, P.M., "Unemployment Dispersion as a Determinant of Wage Inflation in the U.K., 1925-66", Manchester School, June 1971. pp. 83-113.
- Thurow, L.C. "The Changing Structure of Unemployment : An Econometric Study", Review of Economics and Statistics, May 1965, pp. 137-149.
- U.S. Bureau of Labor Statistics, "The Extent and Nature of Frictional Unemployment", Study Paper No. 6, Study of Employment, Growth and Price Levels, Joint Economic Committee, 86 Congress, Session 1, 1959.
- Upcher, M.R. "Regional Unemployment in Tasmania : An Econometric Approach", unpublished honours dissertation, University of Tasmania, 1972.

- Warren, K. "American Regional Unemployment Problems and Policies", Three Banks Review, no. 63, September 1964, pp. 26-41.
- White, H.C. "Matching, Vacancies and Mobility", Journal of Political Economy, vol. 78, 1970, part 1, pp. 97-105.
- Wilson, D.F. "Unemployment Flows and the Level of Business Activity", CEDA Growth 20, 1969.
- Wood, J.B. "How Much Unemployment?", London : Institute of Economic Affairs, 1972.
- Zaidi, M.A. "Unemployment, Vacancies and Conditions of Excess Demand for Labour in Canada", Applied Economics, vol. 2 no. 2, 1970, pp. 101-112.